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A SKETCH  
OF  
THE PRINCIPLES AND PRACTICE  
OF  
SUBCUTANEOUS SURGERY,

BEING  
THE ORATION  
DELIVERED BEFORE  
THE MEDICAL SOCIETY OF LONDON,

AT THEIR EIGHTY-FOURTH ANNIVERSARY, MARCH 9, 1857,

BY  
WILLIAM ADAMS, F.R.C.S.

SURGEON TO THE ROYAL ORTHOPÆDIC HOSPITAL, LECTURER ON SURGERY AT THE  
GROSVENOR PLACE SCHOOL OF MEDICINE, ADJOINING ST. GEORGE'S  
HOSPITAL, LATE DEMONSTRATOR OF MORBID ANATOMY  
AT ST. THOMAS'S HOSPITAL, ETC.

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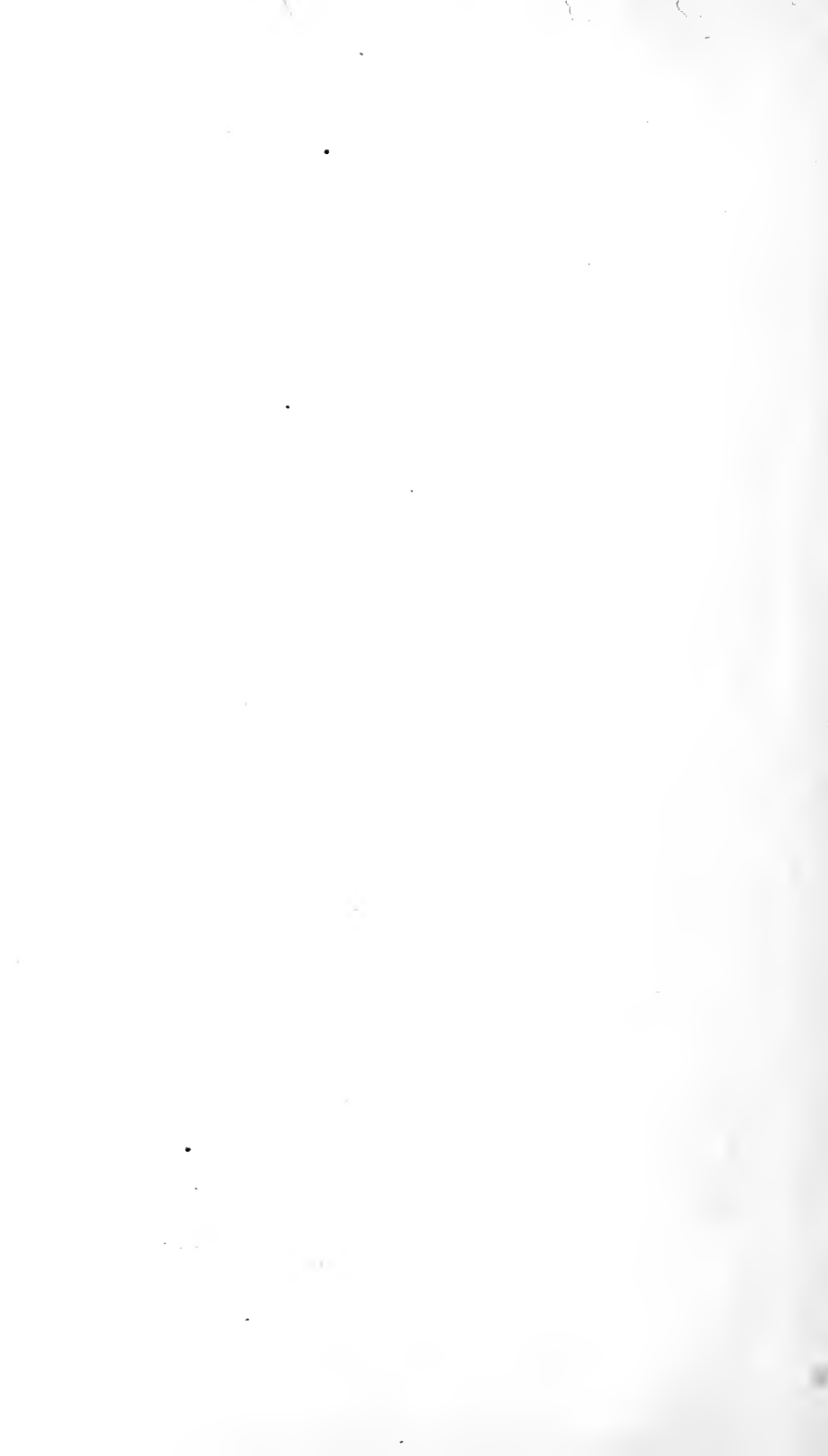
W. D. CHOWNE, M.D.

PRESIDENT OF THE MEDICAL SOCIETY OF LONDON,

THE FOLLOWING ADDRESS

IS

MOST RESPECTFULLY INSCRIBED.



## P R E F A C E .

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IN publishing the present Address, I have endeavoured to give to it some additional interest and value, by adding the details, historical as well as practical, of many of the operations to which it has been my object to draw special attention. This has, I trust, enabled me with greater clearness to elucidate the pathological principles upon which these operations are based, and the conditions upon which their security and successful results essentially depend. The usefulness of such details to some of my readers will, I hope, be accepted as a sufficient excuse for now inserting what was necessarily omitted at the delivery of the Address.

Henrietta Street, Cavendish Square,  
Nov. 1857.



## SUMMARY OF CONTENTS.

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THE occasion of this Address.—Allusion to the deceased Members of the Medical Society.—Objects and advantages of pathological investigations, not only in relation to medicine, but as leading the student of natural science to the discovery of some of the great LAWS of life, the investigation of which constitutes the highest object of human enquiry. Labours of J. H. Green in connexion therewith.—Object of the present address to prove the accuracy, and to show the surgical application, of one of the most important LAWS of the reparative process in wounds discovered by Hunter.—Law of the reparative process in subcutaneous and open wounds.—My reasons for selecting this subject.—Orthopædic Surgery.—Importance of recognizing Hunter's claim to the Law which governs the reparative process in subcutaneous and open wounds; because the same law has been laid down and made the basis of the so-called "subcutaneous method," by M. Jules Guérin, without allusion to the labours of Hunter.—Illustrations given by Hunter.—Additional illustrations of the reparative process in subcutaneous injuries and open wounds.—Observations on the reparative process in a class of injuries intermediate between subcutaneous and open wounds; viz. open wounds quickly closed.

Application of the facts observed in the repair of subcutaneous injuries to the surgical treatment of open wounds, so as to bring the latter more or less perfectly into the same conditions as the former; as in the ordinary treatment of incised wounds, the treatment of burns and scalds, and the treatment of lacerated and punctured wounds by the natives of India and the uncivilized portions of the world.—Successful mode of treating compound fractures adopted by the late Mr. Bennion, of Shropshire.—Important views of Stromeyer on the treatment of compression from compound fracture of the skull with depressed bone, based upon the observation of the reparative process in subcutaneous and open wounds. The application of the trephine opposed. Remarkable success of the non-operative treatment.

The relations of the reparative process to that of inflammation, and importance of investigating the conditions which determine the existence or non-existence of the inflammatory complications of wounds.—Labours of Mr. Paget.—What influence does exposure to the air exert upon the

reparative process in wounds?—Recent discussion on “the subcutaneous method” in the Académie de Médecine of Paris.—How does the air act in exciting inflammation?—Experiments of Ingen-Housz on the influence of different gases in exciting or allaying pain when applied to a blistered surface.—Similar experiments repeated by Dr. Snow and myself, proving the irritating influence of oxygen gas (detailed in the Appendix).—Differences observed by Mr. Paget in the mode of development of the material effused during the reparative process in subcutaneous and open wounds, corresponding to the differences in the clinical history of these two classes of wounds.

Application of the Hunterian Law of the reparative process in subcutaneous and open wounds, to the practice of Operative Surgery.—Conditions which must co-exist to render subcutaneous operations exempt from inflammation.—Historical allusions, and acknowledgment of M. Guérin’s labours in the development of subcutaneous surgery.—Subcutaneous operations arranged in Five Classes, according to the objects with which the subcutaneous method is adopted, in reference to the inflammatory process; viz.—1st. The avoidance of inflammation. 2nd. The avoidance of inflammation and the development of a new connective tissue, formed independently of the inflammatory process. 3rd. The avoidance of excessive inflammation, when its occurrence cannot, with certainty, be prevented. 4th. The production of a little and avoidance of excessive inflammation, when this process, in a limited degree, is essential to the reparative effort. 5th. Arresting the inflammatory process when it already exists, and averting some of its troublesome consequences. Several examples of each class are given in illustration.—Operations which hold an intermediate position between the subcutaneous and open wounds: Open wounds quickly closed. Examples.—Concluding remarks.

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## APPENDIX.

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NOTE I.—Experiments performed by Dr. Snow and Mr. Adams.

NOTE II.—On the subcutaneous removal of loose cartilages.—Successful case by Mr. Square of Plymouth—Letter to Mr. Square from Professor Syme, asserting his claim to the discovery of this operation.—Mr. Syme’s claim discussed in a letter by Mr. Adams, and the priority of M. Goyrand established.—Additional Note by the Author, on the method of Dupresse Chassaigne, M. Guérin, &c.

NOTE. III.—On the subcutaneous division of varicose veins, proposed by Sir Benjamin Brodie.



MR. PRESIDENT AND GENTLEMEN,

THE anniversary meeting of the Medical Society of London—the parent of all the other medical societies of this metropolis—is always an event of interest to a large section of the medical profession ; and the interest which attaches to this annual gathering is in no degree diminished by the fact, that the present is the eighty-fourth occasion on which the institution of this society has been celebrated.

Whilst anniversary meetings, in their general aspect, are occasions of cheerful interest, they are seldom unalloyed with reflections and considerations of a melancholy nature, to which the present forms no exception. The unsparing hand of time has, since our last annual meeting, erased from the list of this society some of its members, whose names had long and honourably been associated with its progress.

I mention with regret the loss of Dr. Clutterbuck and Mr. Guthrie, two men distinguished in the departments of medicine and surgery—men who laboured long and successfully for the advancement of science and the benefit of mankind, and whose names will be handed down to posterity in connection with the general doctrines of disease which they laboured to establish, and the progressive state of science at the period in which they lived. The name of Clutterbuck

will be especially remembered in this society, of which he was one of the most active and zealous supporters during many years of his life. Of late, he seemed to serve as the connecting link between the present and the past generation. Well must we all remember his venerable form sitting in this room last year, listening to the eloquent and learned address of my colleague, Dr. Richardson; and it is no small matter of regret that an accident, met with as he was walking home on that day, was the occasion of his last illness.

The name of Mr Guthrie, also, stands prominently on the walls of this society, and it will not be forgotten that he delivered the first course of the Lettsomian lectures established by this society.

In turning from this portion of my duty, a reflection crosses my mind that many of those who have this day honoured me with their presence, have also listened to some of the brilliant and instructive orations of my predecessors, whom I can as little hope to rival in oratorical display, as in offering for your consideration any such matured philosophical reflections as have pre-eminently characterized many of the orations delivered before this society.

Fully sensible of the accumulated difficulties which my predecessors have imposed on the task of selecting a subject for the present address, I have still, however, sufficient confidence in the inexhaustible nature of the materials afforded by the scientific studies which form the basis of professional knowledge, to encourage me in the hope that I may select a theme of sufficient



interest. The greater difficulty, however, viz. that of bringing the subject selected before the members of this society with sufficient attractiveness—either from the addition of new material and original observations, or from a new and more extended application of existing knowledge,—still remains, and would overwhelm me with hesitation and embarrassment, did I not feel, from a personal knowledge of the members of this society, a confident reliance on the indulgent criticism of my present audience.

I feel the more in need of this indulgence, from the consciousness of my inability to impress the subject I have selected with the weight of authority which a more lengthened practical experience would necessarily give. My professional life, up to the present time, has been chiefly passed in the school of pathological observation and experiment. During the twelve years (from 1842 to 1854), I continued to labour in the school of St. Thomas's Hospital, as Curator of the Museum and Demonstrator of Morbid Anatomy, my attention was chiefly devoted to pathological investigations in their relation to surgical practice. But when so large a field as that afforded by one of our metropolitan hospitals is open to us, we are stimulated to persevere in the course of patient and laborious investigation of the phenomena of disease, not only by the immediate practical results in reference to the treatment of individual cases, and the insight thus afforded into the nature of diseases daily passing under our notice, but by the

knowledge that, in proportion as we succeed in correctly interpreting such phenomena in relation to the organic functions in health, are we led to the discovery of those fixed immutable LAWS by which all the phenomena of LIFE in health and disease are governed, and which, when ascertained, give to them their connexion and intelligibility. Thus do we approach the threshold of the highest branch of human knowledge, which, in its aim and object of ascertaining the great truths of natural science in reference to *the idea* and final purpose of life, as expressed in the organization of the animal kingdom, calls forth the highest powers of the human intellect; such powers as few of us, indeed, save the more gifted sons of genius, can boast the possession. Foremost among such men in the present generation, who, in their endeavour to elevate the study of medical science, have led the student through the strictest method of philosophical inquiry, to the investigation of the great LAWS of life and the final purposes of creative power, as evidenced in the animal kingdom,\* a lasting memory will attach to the name of Joseph Henry Green, to whose public teaching and private friendship I am equally indebted for the development and direction of such powers and energies as I may happen to possess; and whom I have long been accustomed to regard not only with the respect of a pupil, strengthened by a personal attachment commenced in a childhood acquaintance, but with the

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\* "Vital Dynamics," by J. H. Green. London, 1840.

veneration for his high intellectual attainments and moral worth, which, added to his calm dignity and impressive eloquence, have peculiarly endeared him to his professional brethren.

Of Mr. Green, it may also be said, that he is not less distinguished by his scientific acquirements, than by his ability as a practical surgeon; and in the annals of English surgery his name will be recorded as one of the most successful operators, especially in lithotomy;\* but those who have had the advantage of witnessing his practice, know that his recorded success in this operation is but the type of his generally successful surgical practice.

With these general observations on the importance of pathological investigations, not only in their relation to the great objects of medical science, but as a part of a more comprehensive scheme of inquiry into the LAWS of life, the investigation of which constitutes the highest object of human inquiry, I will proceed to the more immediate object of this address, which will be to prove the accuracy, and to show the surgical application, of one of the most important laws of the reparative process in wounds discovered by Hunter. The law relates to the reparative process of wounds as influenced by inflammatory complications, and expresses the most important conditions under which inflammation, as a rule, is either

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\* Mr. South, in his edition of Chelius' System of Surgery, London, 1847, states that "Green cut about forty cases successively, without losing a case." —page 592, vol. ii.

absent in the reparative process, or exists in excess, *i. e.* in the suppurative form, and acts as a serious complication and hindrance to the perfection of the reparative efforts of nature. The conditions expressed in the law to which I refer relate to the exposure and the non-exposure of wounds to the influence of the air.

John Hunter, in his "Treatise on the Blood, Inflammation, and Gun-shot Wounds," published in the year 1794, points out as a great fundamental principle, in reference to the healing of wounds, the difference between those two forms of injuries, of which one is subcutaneous, the other open to the air. He says:—"The injuries done to sound parts, I shall divide into two sorts, according to the effects of the accident. The first kind consists of those in which the injured parts do not communicate externally, as concussions of the whole body or of particular parts, strains, bruises, and simple fractures, either of bone or tendon, which form a large division. The second consists of those which have an external communication, comprehending wounds of all kinds, and compound fractures. Bruises which have destroyed the life of the part may be considered as a third division, partaking, at the beginning, of the nature of the first, but finally terminating like the second. The injuries of the first division, in which the parts do not communicate externally, seldom inflame, while those of the second commonly both inflame and suppurate."\*

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\* See "Hunter's Works," by J. F. Palmer, vol. iii, p. 240.

The deviations from this law in particular instances are then adverted to. Here, then, is the law of the reparative process in these two great classes of injuries.

“In these sentences,” observes Mr. Paget, Hunter has embodied the principle on which is founded the whole practice of subcutaneous surgery; a principle of which, indeed, it seems hardly possible to exaggerate the importance.”\*

I have been especially induced to select this subject on the present occasion, because, during the last six years, my connection with the Royal Orthopædic Hospital has afforded me ample opportunities of witnessing the results of a new branch of surgical practice, viz. the treatment of deformities, the success in which mainly depends upon the skill with which certain operations are performed in a manner to prevent the exposure of the wounds to the influence of the air. These operations are performed in various parts of the body, and include the subcutaneous division of tendons, muscles, ligaments, &c. The classification of these and other subcutaneous operations which I propose to adopt in illustration of the truth of the law above adverted to, will necessarily include a general sketch of the principles and practice of subcutaneous surgery.

Now, I apprehend that no difference of opinion

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\* “Lectures on Surgical Pathology.” London, 1853.

can exist amongst scientific surgeons of the present day, with respect to the value and practical importance of subcutaneous operations ; and therefore I am desirous of asserting the claim of Hunter to the discovery of the general law upon which the security of the patient essentially depends in these operations.

It is the more important, at the present time, that Hunter's claim should be distinctly recognised, because M. Guérin, to whom we are much indebted for the advancement of subcutaneous surgery, and to whom one of the prizes of L'ACADÉMIE DES SCIENCES of Paris has lately been awarded in acknowledgment of these services, lays down precisely the same law, and in the same words as those quoted from Hunter, without even so much as the mention of Hunter's name. The introduction to M. Guérin's "*Essais sur la Méthode sous-cutanée*"\* commences with the following sentence :—" I have proposed in this memoir to establish a new principle, and to indicate some of the applications of which it is susceptible." And in the following page he observes—" I bring it forward as a principle, that all wounds made under the skin and kept from the contact of the air, neither inflame nor suppurate, and organization takes place immediately." He then tells us that he has proved this principle by numerous experiments on animals and operations on man ; that he proposes to make it the basis of a general method pointed out in the memoir ;

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\* Paris, 1841.

and that "the principle of this method is to know that the wounds excluded from the air neither inflame nor suppurate."

It is enough for my present purpose to place these facts side by side, without comment; but it must at least be regarded as additional evidence of the truth of the observation, that those who trace the progress of modern surgery to its source will not fail to discern, in the principles which Hunter established, the germs of almost all the improvements which have been since introduced.

The illustrations given by Hunter, in proof of the general law above adverted to, are sufficiently conclusive. No surgeon, he tells us, could have failed to observe the difference between a simple and a compound fracture, in reference to the progress and result of the case. How rarely is a simple fracture followed by suppurative inflammation, and how seldom does a compound fracture unite without suppuration, even when the wound is small and apparently insignificant.

Here, then, we have two similar accidents produced in the same way, by the same amount of mechanical violence; or it may be that the simple fracture is occasioned by a greater amount of mechanical violence than the compound fracture. The only difference is, that an external wound exists in the one case, and not in the other; yet how different the results! And who can suppose that the difference depends upon the additional injury to the soft tissues

—skin and cellular tissue—which alone distinguishes the compound from the simple fracture.

How severe, also, are the results following open wounds, though never so small, communicating with joints, so frequently fatal to the limb or the life of the patient. And how seldom does any inflammation follow a subcutaneous opening into a joint, if made with proper precautions and followed by appropriate treatment.

These facts are of the utmost importance in a scientific and practical point of view, and suggest reflections of the gravest nature, in reference to the principles of treatment to be adopted in certain injuries.

Again, how rarely are dislocations followed by suppurative inflammation, even though accompanied with laceration of the ligamentary and muscular structures surrounding the joint. One of the most beautiful instances I have ever witnessed of the comparatively innocent nature of severe subcutaneous injuries implicating several joints, was exhibited to this Society by Mr. Hancock, on the 6th of December last. A boy, *ætat.* 12, had his left hand crushed by machinery; it was drawn in between heavy rollers, which were set at one sixth of an inch apart, as I proved, by measuring a flat piece of wood placed between them. All the phalanges and some of the metacarpal bones were more or less crushed, and the hand was perfectly flattened. Fortunately only a very small wound existed, on the inner side of the index



finger. From this circumstance, Mr. Hancock determined not to amputate, but to try and save the hand, though the severity of the injury gave little hope of success. However, the case went on well. Four months after the accident, the fingers had nearly regained their natural form, and slight motion existed in all the joints. The absence of an open wound communicating with the comminuted fractures, determined the practice in this case; and, therefore, to the subcutaneous nature of the injury is this poor boy indebted for the possession of his hand.

Another and very remarkable example of the comparative freedom from suppurative inflammation in severe injuries, unaccompanied with an external wound, occurs in cases of rupture of the eye-ball from a blow, with sub-conjunctival dislocation of the lens. The fact stated by ophthalmic surgeons, that the inflammation following this accident is not always severe; and Mr. H. Walton says, "vision may not be lost\*," is no doubt due in a great measure to the absence of an external open wound. In a Report of operations performed at the Royal London Ophthalmic Hospital, published in the Medical Times and Gazette, July 11, 1857, a case of Mr. Streathfield's is alluded to, of "Luxation, by injury, of the previously cataractous lens inclosed in its capsule under the conjunctiva. The patient had useful vision after its removal." A suggestion, which should be mentioned in connection

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\* Operative Ophthalmic Surgery; London, 1853; page 83.

with subcutaneous surgery, was made by Mr. France, of Guy's Hospital—"not to remove the lens till a fortnight after the accident, so that an opportunity may be afforded for the healing of the sclerotica, and a *simple rupture* may not be converted into a *compound one*, and the chances of recovery perhaps materially diminished." A case of this kind is related by Mr. Walton, from Dr. Landreau, of Lyons, in which acute inflammation did not follow; the lens was removed, by a small incision through the conjunctiva, on the 21st day; and the patient recovered so far as to be able to see with the aid of cataract glasses.

The cases to which I have referred, in addition to the illustrations given by Hunter, are not only evidences of the general truth of the law of subcutaneous wounds, but, in the successful issue of the treatment adopted, prove that scientific surgeons have not failed to take advantage of the facts observed in the natural efforts to repair accidental injuries, and apply them practically to the modification of operative procedures. Thus, in certain cases, operative interference is altogether avoided with the greatest advantage, where, according to the ordinary routine of practice, it might by many be supposed absolutely necessary; and in other cases it is very materially modified.

Holding a close pathological relation to the true subcutaneous injuries, such as dislocations, simple fractures, &c. we have another class in which the

reparative process frequently proceeds as favourably. I allude to open wounds quickly closed, so that a continued exposure to the air is avoided. We see that wounds exposed to the air only for a short time, are frequently, but not invariably, brought into conditions equally as favourable as the true subcutaneous wounds. Notice, for example, the progress of an ordinary incised wound, quickly closed. Even a compound fracture, in which the wound is quickly closed, and all further disturbance to the soft parts prevented by good apposition of the fractured surfaces, sometimes proceeds as well through the reparative process as a simple fracture; but it must be admitted that such a result is far from common.

Mr. Paget has correctly observed: "For, of the two injuries inflicted on a wound, the mechanical disturbance of the parts, and the exposure to the air of those that were covered, the exposure, if continued, is the worst. Both are apt to excite inflammation; but the exposure excites it most certainly, and in the worse form; *i. e.* in the form which most delays the process of repair, and which is most apt to endanger life."\* These observations are supported by reference to the different results in simple and compound fractures, and in simple fractures extending into joints, even when produced by much violence, such as in Mr. Hancock's case, previously adverted to, as compared with the results of small open wounds made

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\* Lectures on Surgical Pathology, vol. i, page 170.

without mechanical violence, but extending into joints, &c.

There can be no doubt that practical surgery might be materially advanced by the application of the facts observed in the repair of accidental injuries of a subcutaneous character, to the treatment of open wounds, so as to bring the latter more or less perfectly into the same conditions as the former. The principle of treating open wounds by excluding the air, and of attempting thus to convert open into subcutaneous wounds, may at the present time be traced, not only in the treatment of incised wounds, which are generally closed as quickly as possible, but also in the treatment of burns and other injuries involving destruction of surface, by various applications which act upon this principle, such as cotton wool, flour, oil, thick cerates, collodion, glycerine, &c.

To me, however, it appears that this principle admits of much more extended application in the treatment of wounds; and that a careful study of the subject from some of the points of view in which I shall endeavour to exhibit it, will lead to important modifications in our method of treating several forms of severe injuries.

I have frequently heard the observation made, by surgeons who have resided long in India, and in the uncivilized portions of the world, that the natives recover in a most surprising manner from severe lacerated and punctured wounds, inflicted by instruments of rude construction. Wounds which would certainly

be fatal to Europeans appear to be very frequently recovered from. Various explanations of this fact will at once suggest themselves, in connection with the constitutional condition of the native population, their simple and healthful mode of life, their diet, &c. But I think that much may also depend upon the method of treatment generally adopted; viz. that of applying some simple application, such as oil, &c. and at once excluding the air from the wound by bandages and soft material, such as cotton, &c. which are allowed to remain undisturbed, unless the unfavorable progress of the case should render their removal necessary. Such treatment appears to be well calculated to prevent suppurative inflammation, the necessary occurrence of which I think we too readily assume, and which it also appears to me that we favour by encouraging exposure to the air, and by omitting local support to the injured part—the use of support being the prevention of congestive or inflammatory exudation into the areolar tissue.

In confirmation of the opinion I have just expressed, I would here allude to a very successful method of healing compound fractures which a gentleman now attending my lectures at the Grosvenor Place School, Mr. Davies, has mentioned to me. This gentleman informs me that the late Mr. Bennion, a surgeon who resided at Oswestry, in Shropshire, was remarkably successful in his treatment of cases of compound fracture, accidents of frequent occurrence in this district. So marked was his success in the

treatment of these injuries, that it became matter of common observation that Mr. Bennion's cases generally did well, whilst the compound fractures treated by the other surgeons in the district were generally fatal. The plan adopted by Mr. Bennion was as follows :

1st. Immediate reduction ; and, in securing a good apposition of the fractured surfaces, he would frequently employ more force than many surgeons might think prudent, so that he very rarely had occasion to saw off any portion of bone.—2ndly. He cleared away all the blood from the wound, considering that it interfered with the reparative process, and brought the edges of the wound in apposition. He then covered the wound with a large bit of lint, saturated with compound tincture of benzoin, and bandaged the entire limb, first by itself, whilst extension was being kept up by an assistant, and then bandaged it to a well-fitting splint, adapted to the case ; in the lower extremity, he used a long straight splint.—3rdly. He put the patient at once under the influence of opium, upon which he placed great reliance, and kept up its action for a considerable time, according to the circumstances of the case.—4thly. He never disturbed the first dressing or bandaging, unless urgent symptoms indicated the necessity of so doing. If such symptoms did not appear, he would allow the first dressing to remain for a month.

I have given the details of this practice as they were related to me by a very intelligent pupil, who had opportunities of witnessing the successful results,

and who, I may add, has not failed to contrast unfavourably the present mode of treating compound fractures in our metropolitan hospitals.

We recognise, in the plan related, the application of two principles not usually adopted in the treatment of compound fractures; viz. 1st. The avoidance of continued exposure of the wound to the influence of the air. This is applied both in the immediate and in the subsequent treatment, evidently with the effect of bringing many of the compound fractures more or less completely into conditions similar to those existing in simple fractures. 2ndly. The application of local support to the part injured, by means of bandage-pressure, which is also extended to the entire limb.

Both these principles will be discussed hereafter; but I would remark that the beneficial influence of well-applied, firm local support, increased by means of a compress where applicable, in preventing inflammation in wounds,—evidently by preventing the infiltration of the cellular tissue, which necessarily follows deep-seated injuries,—is sufficiently demonstrated by the practice at present adopted at the Orthopædic Hospital in all subcutaneous operations. Without it, I believe the deep subcutaneous operations in important regions—as in the popliteal space, the palm of the hand, the sole of the foot, and the leg—would not unfrequently be followed by inflammation. Of course this cannot be applied in the same degree to all cases of compound fracture; but if the value of the principle be admitted, cases will be found in which, especially when seen

immediately after the injury, as was generally the case in Mr. Bennion's practice, it can be applied to some extent.

The practice of sustaining the influence of opium was, no doubt, also a valuable aid, both in preventing inflammation—a purpose for which it is now largely employed in surgery—and in allaying constitutional shock and irritation.

I will now briefly advert to a very important suggestion in surgical practice, arising out of the general pathology of subcutaneous and open wounds. I allude to the recommendation of Stromeyer, one of the highest authorities on military surgery, who was appointed chief of the Schleswig-Holstein army during the campaigns of 1848 and 1851: that the operation of trephining should be discontinued, even in cases of compound fracture of the skull with depressed bone. Being peculiarly impressed with the importance of excluding the air from wounds, Stromeyer, to whom we are indebted for the introduction of subcutaneous tenotomy, in the year 1831, and who may therefore with justice be styled the founder of subcutaneous surgery, traces the fatal results after the application of the trephine to the influence of the air in inducing suppurative inflammation. Stromeyer tells us that although, during the earlier years of his surgical experience, he did not meet with a single case in which the operation of trephining had been successfully resorted to, he adhered to the views taught by Sir Astley Cooper, Brodie, and others: that, in complicated frac-



tures of the skull, trephining must be resorted to, because of the threatened formation of pus. Further experience led him to doubt the correctness of these views, principally because it became apparent to him that the air must exercise a deleterious influence upon a contused part of the brain; no matter whether it be admitted by trephining, or by any operation for removing loose fragments of the skull. After the battle of Kolding, in Schleswig (April 23, 1849), Stromeyer tells us there were eight gun-shot fractures of the skull, with depression, and more or less considerable brain symptoms, in the hospitals of Kolding, Christiansfelde, and Hadersleben. In all these cases, with only one exception, the detachment of the fragments was left to nature. The whole eight patients recovered perfectly, under antiphlogistic treatment.

Stromeyer therefore resolved never to employ the operative treatment again. In the year 1850, after the storming of Friedrichstadt, in Schleswig, two young surgeons came under Stromeyer's care with gun-shot wounds of the head, accompanied by deep depression; they were both subjected to the non-operative treatment, and recovered perfectly.

"From the two campaigns of 1849 and 50, Dr. Stromeyer possesses the notes of forty-one gun-shot fractures of the skull, with depression, in which there was no doubt about the existence of fracture of the skull, because it was denuded. It is, however, doubtful whether the brain or dura mater were injured; because this can only be ascertained by the escape of

cerebral matter from the wound, or by extracting fragments at an early period. Of these forty-one cases, only seven terminated fatally. ....thirty-four were cured, of whom one only had been trephined by Dr. Ross," in consequence of inflammation coming on several days after the wound. With regard to the local treatment, Stromeyer recommends the cautious extraction of perfectly loose fragments and foreign bodies. The removal of impacted balls, he says, should not be attempted ; nor is the external wound to be at first dilated under any pretext whatever. The exclusion of air, the presence of which favours the decomposition of the secretions of the wound, is indicated in all cases. He applies damp linen, which adheres to the wound, and is to be removed only at long intervals. He relies upon cold applications to the head, and anti-phlogistic treatment, especially venesection.

Acting upon these principles, the main object of which is evidently to bring the compound fracture into the condition of a simple fracture, or as nearly as possible to convert an open into a subcutaneous wound, Stromeyer has not trephined during two campaigns, and we have seen the results.\*

The results of the trephine operations during the last war in which this country has been so honourably engaged, are not likely to alter the opinions of Stro-

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\* *Maximem der Kreigsheilkunsh. Von Dr. Louis Stromeyer. Hannover, 1855.* See also an able review by Dr. J. L. W. Thudichum, in the *Brit. and For. Med. Chir. Review*, January 1856, from which the above quotations are made.

meyer. My friend and colleague, Mr. Blenkins, of the Guards, informs me that "the cases of recovery from trephine during the first year of the war were three; the number of cases that were operated on is unknown. In the second year, there were twenty-eight cases trephined, with four recoveries."

The subject is one which will doubtless still further engage the attention of the surgeons of this country; and, without reverting to the opinion which the able reviewer of Stromeyer's work tells us was entertained three hundred years ago, by La Franchi of Milan, who said that, in fractures of the skull, every thing depended upon the assistance of the Holy Ghost, which the surgeon should implore above all things,—I think the surgeons of the present day would do well to consider the influence of the prolonged exposure to the air necessitated by the operation of trephining, in the production of the suppurative inflammation which so commonly ensues, and leads to an unfavourable termination. Evidence of frequent recovery, in cases of depressed fracture of the skull, may be obtained by examining the skulls in the various museums of London. A considerable number of such skulls exist in the museum of St. Thomas's Hospital, and made an ante-trephine impression upon my mind, when I was engaged in describing them eight years ago, for the never-to-be-published catalogue of that collection.

I have now given a few general illustrations of what may be called the subcutaneous law of the reparative process, and have adverted to its influence

in determining the surgical practice in certain forms of injuries.

We see the reparative process in wounds, under various conditions, proceeding either without or with inflammation. The relations of the reparative process to that of inflammation have been most carefully studied by Mr. Paget, whose investigations, both experimental and clinical, concerning the general pathology of the reparative process in all its phases, are too well known and appreciated to require any comment from me.\*

It may, at the present time, be regarded as an established doctrine, deduced directly from pathological and clinical observation, that the reparative process in wounds, the result either of accident or surgical operations, is more perfect in proportion to the absence of inflammation; and that the danger arising from wounds very much depends upon the extent of the inflammatory complications.

It is therefore essential that we should inquire what are the conditions which determine the existence or the non-existence of the inflammatory complications of wounds. My present limits will scarcely permit me to enter upon this wide field of inquiry; and therefore, on the present occasion, I propose to limit my observations to the influence which the exposure to the air appears to exert upon the reparative process in wounds,

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\* Lectures on Surgical Pathology. See vol. i, page 289, for summary of general conclusions on this subject.

the result either of accidental injuries, or of surgical operations.

In the very important discussion on "the subcutaneous method," as M. Guérin called it, which has lately occupied the "Académie de Médecine" of Paris, M. Malgaigne, who comes forward as the opponent of the extended application of the subcutaneous law advocated by M. Guérin, has furnished us with an historical resumé of the opinions of the older surgeons who have advocated, as well as of those who have denied, the injurious influence of the air upon the healing of wounds. In this resumé are included the most interesting points in the history of subcutaneous operations ; but time will not permit me to enter upon this part of our subject.\*

I have no fear that the truth of the observation expressed in the general law laid down by Hunter, that subcutaneous wounds seldom inflame, and that wounds exposed to the air commonly both inflame and suppurate, will at the present day be denied by any scientific surgeon. The extent to which this law may be applied in explaining many of the phenomena of accidental injuries and disease, and the results of surgical operations, will doubtless remain the subject of controversy, though it is improbable that the extreme differences of opinion which have been so attractively arrayed by Malgaigne, will in future hold place in this discussion. One remark I would make, which appears to have been lost sight of in the Parisian discussion ;

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\* Bulletin de l'Académie Impériale de Médecine, vol. xxii, pp. 427—724. 1857.

viz. that it is no objection to the general truth of this law, to say, that exposure to the air is not the only cause of the suppurative inflammation which follows open wounds.

I have certainly no desire to attribute the inflammatory complications of open wounds only to the exposure to the air, even when that exposure is prolonged—the existence of many other causes, constitutional as well as local, has been too well established to admit any such empirical notion ; and in the writings of Mr. Paget, previously adverted to, the relative importance of these conditions and causes have been fully discussed. But I think it will be found that prolonged exposure to the air is one of the most frequent and most important causes of suppurative inflammation in external wounds, and therefore worthy of the serious attention of the surgeon, instead of being treated with utter contempt and neglect, as it undoubtedly is, in the practice of many surgeons of the present day. The tendency of surgical practice in the ordinary treatment of wounds, &c. has been of late to ignore the unfavourable influence of exposure to the air ; and this is somewhat remarkable, when we consider the progress which has been made in some special departments of surgery ; as, for example, in the Ophthalmic and Orthopædic departments, in which, by the strict observance of the Hunterian law of subcutaneous wounds, many of the most important practical improvements have been introduced.

It would be interesting to pursue the physiological

part of this investigation, and inquire—How does the air act in exciting inflammation?

1st. Is it merely the presence of the air acting, *quoad air*, by virtue of its chemical constitution—the action of its oxygen upon the blood and cut surfaces producing chemical changes?

2nd. Is the mere contact of the air with divided surfaces, but without external wound, sufficient to produce inflammation? Or,

3rd. Is it necessary that the continued exposure to the air which external wounds generally involve, should exist as an essential condition? If the continued exposure to the air be necessary, then it may be enquired whether certain other conditions induced by the continued exposure are not equally powerful as the air in producing the inflammation?

I am unable to enter at length into the details necessary to the solution of these questions; but, in reference to the 1st,—I may state, on the authority of Dr. Snow, and in favour of the direct action of the oxygen of the air, that, in a series of experiments performed by Jean Ingen-Housz, a Dutch physician, in the latter part of the last century, it has been shown that when a blistered surface is exposed to nitrogen gas, the pain is diminished; when exposed to the atmosphere, it is increased; and when exposed to oxygen gas, it is still further increased. The experiments have been repeated by Dr. Snow and myself, with the result of confirming the above statement.\*

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\* For a detailed account of these experiments, see Appendix.

Then, with regard to the 2nd question which relates to the conditions necessary to the irritating influence of the air, it must be admitted that the mere contact of the air with divided surfaces, but without an external wound, is not sufficient to produce inflammation, or, at least, that it seldom does so. Of this we see evidence in ordinary cases of emphysema connected with fractured ribs, in which, as a rule, no inflammation of the cellular tissue follows, though the emphysema may be very extensive. Abundant evidence of the same fact has also been recently supplied by Malgaigne in the Parisian discussion, from a series of experiments on animals first rendered emphysematous, and then subjected to various subcutaneous operations, so that the air was in contact with the cut surfaces, fractured bones, &c. No inflammation took place.

Interesting as these experiments are, as bearing upon the explanation of the phenomena, it appears to me that they cannot be in any degree urged against the ascertained fact in reference to the healing of open and subcutaneous wounds expressed in the law upon which we rely as the basis of subcutaneous surgery.

With respect to the 3rd question—There can be no doubt that *continued exposure* of a wound to the air is invariably followed by inflammation, and generally by suppuration. And there can be as little doubt that this is the condition to which Hunter especially referred. With regard to the explanation of the phenomena, however, I would observe that as it is certain, in wounds exposed to the air for any length of time,



several other conditions are also present besides the exposure to the air, such as the separation of cut surfaces, which, being no longer in contact, require the formation of a new connecting tissue,—and, in superficial injuries, the denudation of vascular structures, which therefore require new coverings,—the necessities arising out of these conditions, having reference more especially to the ultimate integrity of the tissues, must be carefully considered, in explaining the nature of the processes which take place, especially in the latter stages of the reparative process. However, I am decidedly of opinion that the continued exposure to the air, and chiefly to the irritating influence of the oxygen gas, is the principal cause of the primary inflammation which, as a rule, takes place in open wounds, and so frequently leads to the more serious complications of suppuration and pyæmia.

Microscopical examination of the material effused during the reparative process, in the two great classes of wounds—viz. the open and the subcutaneous—has confirmed the accuracy of the law which expresses the difference in the mode of development—perhaps indicating differences in the nature—of the material effused for the purpose of repair in these two classes of wounds. The observation of this fact is due to Mr. Paget, who states “that the materials produced for the repair of open wounds are not usually the same, or, at least, do not develop themselves in the same manner as those for the repair of closed or sub-

cutaneous ones\*. Referring you to his valuable Lectures for the details of this subject, I may quote the following: "The general truth appears to be, that the material of repair for subcutaneous wounds of soft parts is developed through the formation of nucleated blastema; while that for repair by primary adhesion, and by granulation, is developed through nucleated cells."

I need only observe that the process of development through large nucleated cells, which gradually elongate and form delicate filaments, is the process by which cellular adhesions are formed from inflammatory lymph, as in the inflammation of serous membranes, &c. and by which granulation and cicatrization take place in open wounds. Where inflammation exists, therefore, this mode of development is always found; and it appears to be a less perfect process of healing than that accomplished through *nucleated blastema*, a material which Mr. Paget proposes to distinguish by the name of *reparative lymph*. In this material, small oval and elongated nuclei are formed, which are easily rendered distinct by the addition of acetic acid; but the large nucleated cells do not appear. The ultimate disposition of these nuclei is uncertain. Mr. Paget thinks they shrivel and disappear; but Henlé describes them as developing into fibres; and with this view I am disposed to agree,

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\* Op. cit. page 172.

from my own observations in numerous experiments which I have performed on rabbits.\*

The nucleated blastema is the material from which bonds of connection are formed after subcutaneous wounds. Divided tendons and muscles are thus connected. The process of development through nucleated blastema is found proceeding in all subcutaneous operations, in proportion to the absence of inflammation. When inflammation takes place in subcutaneous operations, the two processes may coexist and their products mingle; but Mr. Paget observes, "they bear an inverse proportion to each other; and the more manifest the signs of inflammation, the less is the quantity of the proper reparative material, and the slower, in the end, the process of repair."

With these observations on the general pathology of the reparative process in wounds, the result either of accident or operation, as influenced by the exposure or non-exposure to the air, we now approach the more practical portion of our subject; viz. the application of the well-ascertained facts in the pathology of subcutaneous wounds to the practice of operative surgery.

I propose to demonstrate how completely modern surgery has proved the accuracy of the Hunterian subcutaneous law, deduced from observations of the reparative process in wounds the result of accident or

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\* See Trans. Path. Soc. vol. vi, for account of "A Series of Experiments illustrating the Reparative Process in the Tendons of Rabbits, after Division by Subcutaneous and Open Wounds," read 1st of May, 1855. And also Med. Times and Gazette for January 12th, 1856.

disease ; but equally applicable, when certain conditions are fulfilled, to operative surgery. And also I propose to show how far modern improvements are continuing to extend in the direction of subcutaneous operations.

In many surgical operations, especially those rendered necessary by accidents or disease, the ultimate success must depend very much upon the circumstances under which the operations are performed, and is in a less degree dependent upon the skill of the operator. But operations, the time for performing which can be selected, and the circumstances under which they are performed can be controlled in a great degree by the surgeon, pre-eminently depend, for their success, upon the operative skill of the surgeon. This is especially the case with the great majority of subcutaneous operations ; for there can be no doubt that a clumsily performed subcutaneous operation may be as dangerous as an open wound ; sometimes even more so.

The several conditions that must necessarily coexist, to render these operations free from inflammatory complications, and consequently safe modes of procedure ; and the requisites which the fulfilment of these conditions demand on the part of the surgeon—as to his manual tact and skill in performing delicate operations, his anatomical accuracy, and his judgment—will necessarily lead to these operations being more or less successful in the hands of different surgeons. It is essential that this fact should be borne in mind, in estimating the value of the subcutaneous method ;

because we know that the subcutaneous nature of a wound is not of itself a sufficient protection against inflammatory complications.

It is undoubtedly true that subcutaneous wounds, in accidental injuries, are sometimes followed by severe and even fatal inflammation. Of this we see examples in the unfavourable results which frequently follow punctured wounds. These results, however, depend—1st. upon the fact that punctured wounds, in accidental injuries, also generally partake of the character of lacerated wounds, as when made by blunt instruments, such as bayonets, &c ; 2nd. upon the laceration of important parts, as blood-vessels, &c. ; 3rd. upon the effusion which generally follows, and which, when excessive, or occurring in unhealthy constitutions, is apt to degenerate and produce inflammation. I believe such results would be best avoided, when the wound is in the extremities, by immediately applying a firm compress to the part, and bandaging the entire limb.

So, also, it is true that we occasionally see severe inflammation following clumsily performed subcutaneous operations. I have witnessed suppuration up to the popliteal space in one instance, and up to the calf of the leg in another, from clumsily performed subcutaneous divisions—or attempted divisions—of the posterior tibial tendon. In these cases the operations were performed with great disturbance of the soft parts, and no attention was paid to the after-treatment. And the late Mr. Wilson, of Manchester,

told me that he once amputated a leg at the thigh, in consequence of suppuration in the popliteal space following division of the hamstring tendons. These facts, when compared with the almost absolute immunity from inflammation which subcutaneous operations enjoy when carefully performed, only prove that there are certain conditions which must coexist, to render the subcutaneous operations exempt from inflammation.

These conditions are: 1st. that the knife used must be of small size; 2nd. that the operation must be performed quickly and neatly, with decision rather than force, and with as little disturbance to the soft parts as possible; 3rd. that the wound must be immediately closed, and a compress and bandage applied, so as to prevent effusion and to support the part; 4th. that perfect quiescence to the part be insured for three or four days, and the dressing remain undisturbed. When all these conditions are strictly observed, it matters little whether large muscles, or tendons, or ligaments are divided; or even whether the large joints of the body are opened; there is no better established fact in surgical practice, than that subcutaneous wounds seldom inflame or suppurate, when the above-named conditions are fulfilled.

Much as we are indebted to Delpsch, Stromeyer, Dieffenbach, Dupuytren, Goyrand, &c. for the introduction and gradual improvements of subcutaneous operations, it is undoubtedly to M. Jules Guérin that we owe the first attempt to bring together in one group the facts observed in subcutaneous injuries and

subcutaneous operations ; and, by generalizing from these facts, to show that, for the immunity from inflammation which they enjoy, and the perfection of the reparative process, such wounds essentially depend upon the same general law. Although I refuse to admit M. Guérin's claim to originality in the discovery of the subcutaneous law, which is purely Hunterian, there can be no doubt that for its development and surgical application we are principally indebted to the labours of M. Guérin. Whether Hunter ever performed any subcutaneous operations, may be somewhat doubtful ; but it is believed that some of the tendons of animals preserved in the Museum of the Royal College of Surgeons, to illustrate the reparative progress, were divided by Hunter subcutaneously\*.

The surgical operations to which the subcutaneous method of operating has been found to be especially applicable, are sufficiently numerous, and they differ in respect of the objects to be effected, so as to admit of arrangement in five distinct classes. I do not allude to the ultimate objects for which the operations are performed, but to the special objects to be effected by performing them *subcutaneously*, in reference to the avoidance or modification of the inflammatory process ; and also in reference to the perfection of the reparative process.

I will now proceed to describe the five classes in which I propose to arrange all the subcutaneous ope-

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\* See Catalogue of Coll. of Surgeons' Museum, vol. ii, Specimens 349 to 350.

rations, enumerating some of them included in each class. It is not my intention to describe the various operations, but to show the advantages of performing them subcutaneously, as compared with the disadvantages of performing them by open wounds.

CLASS I. The operations which I propose to include in the first class are performed subcutaneously, with the sole object of avoiding the inflammation and its consequences, which would necessarily ensue if they were performed by open wounds.

Operations are generally performed, with this view, in important organs or regions in which inflammation would either be dangerous to the life of the individual, or involve loss of function of the part. In this class, a very large number of subcutaneous operations are included, of which the following are the principal examples.

*Ex. 1.* The removal of loose cartilages from the joints by subcutaneous incision, as first performed by Mons. Goyrand, of Aix. There can be no doubt that the subcutaneous method, by which this operation is at present performed, deservedly ranks amongst the greatest improvements of modern surgery, and is the only procedure consistent with the safety of the limb or of the patient\*.

*Ex. 2.* The division of articular ligaments to facilitate the reduction of old dislocations and the removal of deformities. These operations have been frequently performed, and prove that the joints may

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\* For observations on Mr. Syme's claim to this operation, and an account of a successful case recently treated by Mr. Square, of Plymouth, see Appendix, Note 2.



be opened subcutaneously with very little risk. I have not witnessed any injurious amount of inflammation in a single instance. Within the last year, I have assisted my late colleague, Mr. Lonsdale, in operations for the subcutaneous division of shortened or retracted ligaments, in which he opened the elbow joint, the ankle joint, and the joints of the fingers, without any untoward results.

*Ex. 3.* Many of the operations on the eye are essentially examples of the class we are now considering, although the punctures are made through textures differing from the skin; for example, the needle operations for cataract, drilling, &c.; also the operation for artificial pupil; and the introduction of minute scissors in canular sheaths through punctured openings in the cornea, &c.

It cannot be doubted that the success which attends many of the operations in ophthalmic surgery depends very much upon the care with which the conditions, necessary to the avoidance of inflammation in subcutaneous operations, are observed. The subconjunctival division of the tendons of the recti muscles for strabismus may be mentioned as a recent improvement, now attracting the notice of the profession. This operation was published by M. Guérin in the year 1840\*. Mr. C. Brooke†, Mr. Critchett, and Mr. Holthouse are the

\* Gazette Médicale, Oct. 26th, 1840. .

† Mr. Brooke's paper "On the advantages of sub-mucous tenotomy for the relief of Strabismus," was sent to the Med. Chir. Soc. Dec. 3rd, 1845, and read Jan. 27th, 1846. Mr. Brooke informs me that he performed this operation in numerous cases as early as August, 1840, and was not then aware of M. Guérin's observations.

surgeons who have brought its merits before the profession in this country. Mr. Critchett, who performed this operation in March, 1852, observes, "In the old operations for strabismus, severe inflammation often followed, and the cure was usually protracted over many weeks. In the subconjunctival plan, it is well in three or four days, invariably, as far as I have yet seen, and I speak from some hundreds of cases." Other advantages as to the appearance of the eyes, a diminished tendency to eversion, &c. belong to this improvement.

*Ex. 4.* In one category may be included numerous operations for the evacuation of the fluid contents of cavities and tumours, either not produced by inflammation, or in which inflammation does not exist at the period of operation; such as the ordinary operations for tapping in abdominal dropsy, in spina-bifida, cystic tumours, hydrocele, hydrocephalus, and collections of fluid under a great variety of circumstances. The openings made in these operations are either direct or indirect; but the principle common to all of them is that of avoiding an open wound and continued exposure to the air, with the view of preventing inflammation and its consequences.

*Ex. 5.* Some operations for the removal of deformities, in which the subcutaneous method is adopted simply to avoid inflammation;—such as Dieffenbach's treatment of depressed cicatrices by dividing the subjacent adhesions frequently connected with the periosteum. When these depressed cicatrices occur

about the face, neck, arms, or fingers, unsightly appearances may be thus removed."

Also Dieffenbach's method of removing some of the deformities of the nose, such as depressions of the cartilaginous ridge or the alæ, by subcutaneous divisions of the cartilages in some cases, and, in others, by inserting a small knife into the nostril, and subsequently restoring the form by filling the nostril during the healing\*.

All the operations of which I have now spoken as included in the first class or division of our subject, are performed subcutaneously with one and the same object; viz. that of avoiding inflammation and its consequences.

CLASS II. The operations which I propose to include in the second class are performed subcutaneously, not only with the object of avoiding inflammation, which would necessarily follow if they were performed by open wounds; but also of obtaining a new connective tissue between the divided parts, formed independently of the inflammatory process, and adapted to the restoration or improvement of the functions of the part.

This new connective tissue may be either a reproduction, or new formation, of the normal tissue of the part, when the structure divided is capable of reproduction; or it may be simply a fibro-cellular tissue which may serve the purpose of a new connecting bond

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\* Die Operative Chirurgie. Von J. F. Dieffenbach, Leipzig, 1845. See also Brit. and For. Medical Review, vol. xxi, 1846, page 289; *ibid.* 300.

of union to the divided structures, when they are not capable of reproduction.

*Ex. 1.* The operation in which the above-mentioned objects are best accomplished is subcutaneous tenotomy.

By this operation a new formation of perfectly formed tendon is obtained, of sufficient length for the purpose required, by organisation of a proper reparative material effused, independently of the inflammatory process. It has been satisfactorily proved by Mr. Paget, in opposition to some of the highest French and German authorities, that neither the effusion of blood, nor the accession of inflammation are necessary to this process, which is more perfect than any other effort of repair with which I am acquainted; but, on the contrary, that both the effusion of blood and inflammation retard this reparative process, and render it less perfect in proportion to the extent to which they exist. These observations have also been confirmed by an extended series of experiments in rabbits, made by myself, some of the results of which are exhibited in the diagram before you\*. The process of development of new tendon is that already described as usually taking place after subcutaneous operations by nucleated blastema.

So well known and appreciated by the profession are the advantages of subcutaneous tenotomy, that it is unnecessary for me to enlarge upon its merits.

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\* These experiments, previously referred to, are recorded, with illustrations, in the *Trans. Path. Soc.* vol. vi; and in *Med. Times and Gazette* for Jan. 12, 1856.

When we consider the extent of its application, and the benefits it has conferred upon many thousands of our afflicted fellow-beings, in the cure, not only of club-foot, but of many other deformities which would either have pauperized the sufferers, or blighted their fairest prospects in life ; we may, without fear of contradiction, claim for subcutaneous tenotomy the highest rank among the practical and scientific improvements of modern surgery.

*Ex. 2.* There is another operation included in the second class we are now considering, and essentially similar to that of subcutaneous tenotomy, but differing from it, in its results, in this respect : that the newly formed connective tissue is unlike the structure which it serves to connect. Subcutaneous myotomy is the operation to which I allude. Muscular tissue, unlike that of tendon, is never reproduced ; and the divided extremities of a muscle are reunited by fibro-cellular tissue, as shown in the diagram.

The principal applications of this operation are the subcutaneous division of the sterno-mastoid muscle for wry-neck ; the subcutaneous division of the spinal muscles for lateral curvature of the spine, suggested and still extensively practised by M. Guérin ; and the subcutaneous division of strictures of the urethra. Of the last-named operation we find the first mention in an article on the *Perinæal Section* of Syme, by my friend, Dr. H. Dick\*. A successful case is related in this article by the author ; and since that time, two other successful operations have been performed by

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\* Med. Times and Gazette, 28th May, 1853.

him. Dr. Dick also presented a memoir on this subject to the Academy of Medicine of Paris on the 23rd of October, 1855 ; and the method of procedure is there fully detailed.

The subconjunctival operation for strabismus, which has been already alluded to in the first class, cannot properly be included in the series we are now considering ; because, in this operation, it is not the object to obtain elongation of the divided muscle or tendon, by the formation of a new connective tissue, but simply to detach the insertion of the muscle from the globe, with the object of gaining a new attachment in a more appropriate place.

CLASS III. The operations which I propose to include in the third class are performed subcutaneously, with the object of avoiding excessive inflammation, where the occurrence of inflammation cannot with certainty be prevented.

*Ex.* 1. The operation for straightening bent and ankylosed joints (ligamentous or bony) by what is termed “forced rupture,” or “forcible extension.” This procedure has been of late revived and recommended by Langenbeck, P. Frank, and others, as preferable to the plan more generally adopted, and now employed at the Orthopædic Hospital ; viz. of subcutaneous tenotomy and gradual mechanical extension—but, in my opinion, is only applicable to cases in which the milder operation has failed. It is certainly not free from danger, especially in bad constitutions. Serious and even fatal inflammation, rupture of the skin and of the large vessels, &c. are amongst the

accidents which have followed this operation ; but the danger is far less than it is in such an operation as resection, where we necessarily have to do with an open wound. In fact, the difference is precisely that which exists between simple and compound fracture. In appropriate cases, however, the operation is certainly a valuable addition to subcutaneous surgery.

It has recently been performed, with great success, in a large number of cases by Mr. Erichsen, Skey, Stanley, and my late respected friend and colleague, Mr. Lonsdale. I assisted Mr. Lonsdale to perform this operation in several cases of contraction of the knee-joint, one of the hip, and one of the elbow. Very little inflammation followed, and this soon subsided. The knee-joint cases were the most satisfactory ; but motion, to a useful extent, was not obtained in any instance.

*Ex. 2.* The operation for hernia, without opening the sac, may be included in this class, as its object is to avoid excessive inflammation by excluding the air from the peritoneal cavity. This operation, proposed by L. Petit, is, as Malgaigne remarks, “the first scientific mention of the subcutaneous method.” It is unnecessary for me to speak of the advantages of this operation in appropriate cases. Through the advocacy of Mr. Luke, it has now become generally recognized and adopted in this country.

CLASS IV. The operations which I propose to include in the 4th Class are performed subcutaneously, with the object of producing a little, and avoiding excessive, inflammation.

Hitherto I have spoken of the subcutaneous method as used to avoid, or to limit, the inflammatory complications of wounds—an object which it is capable of effecting when certain conditions are fulfilled. But I have already pointed out that, when subcutaneous operations are clumsily performed, *i. e.* accompanied with much disturbance of the soft parts, inflammation is commonly set up. Tissues which are bruised and lacerated in such operations generally inflame, and occasionally suppurate, though the latter termination is rare, unless the cutaneous wound is larger than it ought to be, and the air thus admitted. As a rule, the inflammation following such operations is of moderate intensity, and does not proceed to suppuration ; or if it does proceed to suppuration, this is of limited extent ; but there is no doubt that these operations are attended with an increased amount of risk.

Now, surgical operations are sometimes undertaken with the view of exciting a limited amount of inflammation, for the purpose of restoring the functions of the part, or of inducing some compensative condition, with a curative intention ; and with this object, subcutaneous operations roughly performed are sometimes useful, where open wounds might be dangerous. The following are examples of such operations.

*Ex.* 1. Various operative procedures for producing osseous union in fractures which have failed to unite. The common object of these operations in cases of ununited fracture is to excite a limited amount of inflammation, under which it is known that bony matter is generally thrown out, and firm union obtained.



Various methods are adopted to accomplish this object; such as :

*a.* The introduction of a seton passed deeply between the separated ends of the bone.

*b.* The introduction of ivory pegs into the bone close to the fractured surfaces. This practice has been of late adopted by Mr. Stanley and other surgeons with very great success.

*c.* A more perfectly subcutaneous operation, performed by introducing a tenotomy knife, and completely detaching the soft tissues from the fractured surfaces which are afterwards brought into apposition.

The last-named operation has frequently been successful, and, as a less severe method than the preceding, may be adopted first. It has recently been applied with success, by M. Malgaigne, to the ununited fracture of the patella, which has hitherto been considered quite irremediable. In cases of fracture of the patella with wide separation, Malgaigne has proposed to denude the fractured surfaces subcutaneously, and draw the fragments together by means of a steel hook and screw apparatus of his own invention, such as he applies to cases of recent fracture of the patella where exact apposition cannot be otherwise obtained. These cases of wide separation are supposed to be due to elongated ligamentous union; but when describing the preparations in St. Thomas's Museum, and more especially from examining the specimen figured by Sir A. Cooper, in his work on Dislocations and Fractures,\* I arrived

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\* London, 1823. Plate xvi, Fig. 1.

at the conclusion, that in such cases no ligamentous union had ever taken place ; that the reparative process had been entirely arrested ; and that the fragments were merely connected by the fascia and aponeurotic structures over the knee-joint, in a thickened condition\*.

*Ex. 2.* With the object of producing a little, and avoiding excessive, inflammation, various operations are performed for the obliteration of serous cavities by the introduction of foreign substances ; such as the injection of iodine and a variety of irritating liquids into the cavities of hydroceles, ovarian tumours, &c. In this category, also, may be included the operation for the cure of bursæ by free subcutaneous incisions. There are some bursæ of long standing which cannot be ruptured by a blow ; and when situated over joints—the wrist, for example—the introduction of a seton is dangerous. I once saw a fatal case from this practice in St. Thomas's Hospital. The late Mr. Tyrrell introduced a seton into a bursa over the wrist-joint, and destructive inflammation, involving the wrist and carpal joints followed the operation, and the man died. This case was under treatment at the time of Mr. Tyrrell's sudden death, or probably amputation would have been resorted to. The preparation is in St. Thomas's Museum. Since then, I have successfully adopted

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\* The pathology of this fracture I have described in the 2nd vol. of the Trans. of the Path. Soc. May 6, 1850. An account of my observations, with a drawing of Malgaigne's instrument, will be found in Druitt's Manual of Surgery, 7th edition, 1856, page 246 ; and they are also alluded to in Ferguson's Practical Surgery, 4th edition, London, 1857, page 394.

the plan of making free subcutaneous incisions with a tenotomy knife, and afterwards applying firm pressure for several days.

The operation for the radical cure of reducible inguinal hernia, devised and practised with so much success by Professor Wützer, of Bonn, also belongs to this class. The object is to invaginate the hernial sac through the length of the inguinal canal by pushing a portion of the skin into it. The inverted skin is retained in the canal by a wooden plug, and the obliteration of the canal effected by a needle passed from within outwards through the integument, and also by the continuance of mechanical pressure. The plan is detailed, and numerous successful cases related, by my colleague, Mr. Spencer Wells, in the 19th vol. of the *Med. Chir. Trans.* 1854. Fifty-seven cases are reported ; death or dangerous symptoms followed in no instance, and the successful cases were very numerous ; but Professor Wützer has not yet published his statistical results. The merits of this operation are now being further tested in this country, and my colleague, Mr. Holmes Coote, and also Mr. Erichsen, have performed it with success.

*Ex. 3.* Various subcutaneous operations for the cure of varicose veins ; such as—*a.* The subcutaneous division of the vein, proposed by Sir B. Brodie, and published in the year 1817, in the *Med. Chir. Trans.*\*

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\* For Sir B. Brodie's description of this operation, and its results, see Appendix, Note 3.

—*b.* The cure of varicose veins by introducing a pin beneath the vein, and passing a twisted suture across the ends of the pin externally, so as to compress the vein between the pin and the suture, and obliterate it by inflammation. A description, by Mr. H. Lee, of the modification of this procedure recommended by him, of dividing the veins subcutaneously after the application of the ligature, was published in a lecture in the first number of the *Med. Times and Gazette* for 1853.—*c.* The subcutaneous ligature for the cure of varicocele as practised by M. Ricord.

*Ex. 4.* Subcutaneous operations for the cure of nævi, by exciting a limited amount of inflammation, are also examples of this class; such as — *a.* The tracking of nævi by single threads;—*b.* The injection of irritating substances;—*c.* The free subcutaneous incisions through the base and substance of the nævus, with the view of causing slight inflammation, effusion, and obliteration of its vessels, recommended by the late Dr. Marshall Hall, in a paper read before the *Med. Chir. Soc.* 11th March, 1834.

*Ex. 5.* The obliteration of fistulous canals by the subcutaneous ligature, as proposed and successfully practised by Dieffenbach. Mr. Milton informs me that he also has successfully employed this operation.

All the operations included in the fourth class, which we are now considering, are performed subcutaneously, with the object of producing a little, and avoiding excessive, inflammation.

CLASS V. The operations which I propose to in-

clude in the fifth and last class, are performed subcutaneously, with the object either of arresting the inflammatory process, or of averting some of its troublesome and unfavourable consequences; such as the painful tension of certain structures, the formation of ulcerated external openings, and the extreme distension of cavities by the contained effusion.

*Ex. 1.* The subcutaneous incision of inflamed periosteum, an operation recommended by Mr. Ferguson to relieve the pain and tension, and diminish the inflammation, of this structure\*.

*Ex. 2.* As an example of this, the fifth, class of operations, I have much pleasure in adverting to a very valuable addition to subcutaneous surgery recently made by a Member of this Society, Mr. Milton; and although of great practical importance, but little known. It consists of applying the subcutaneous method of opening abscesses, to the treatment of bubo, and of performing the operation in a more purely subcutaneous form than has hitherto been done. When suppuration is established, Mr. Milton makes a puncture into it by passing a grooved needle through the healthy skin beyond the inflamed integument. Pus escapes; moderately firm pressure is then applied; and rest enforced. Frequently no further interference is required. A second puncture may be necessary, and very rarely a third. By this plan all the disadvantages of an open wound are got rid of; a cicatrix is avoided;

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\* System of Practical Surgery, 4th edition, 1857, page 178.

poultices, &c. are dispensed with ; and the risk of phagedena, hæmorrhage, and sinuses, Mr. Milton says, is entirely averted. Mr. Milton began this practice in 1849, and published it in 1851 ; but the only hospital surgeon who, to my knowledge, has adopted the practice, is my much-respected friend and former teacher, Mr. South. For several years I know that Mr. South has carried out this practice at St. Thomas's Hospital ; and in a note to me he observes, " I have adopted it so long, and it generally does so well, that we scarcely note it now. Of the excellency of the practice I have not the least doubt."

Mr. South has very kindly sent me the particulars of a considerable number of cases treated upon this plan, which entirely confirm the statements above made. I need not, therefore, further allude to them, except to express my obligation to Mr. South for having directed his dressers, Mr. J. Williams, Mr. Bateson, and Mr. Sutton Sams, to forward them to me. Mr. W. Allingham, formerly one of Mr. South's dressers, has also successfully adopted this method of treating buboes in private practice, and has also sent me the details of his hospital and private cases.

*Ex. 3.* The subcutaneous method of opening abscesses, including psoas and lumbar abscess ; also the evacuation of the inflammatory effusion in serous cavities, as in pleuritis and pericarditis, and in the joint-cavities. In these operations we have every gradation between the valvular opening proposed by Abernethy, and the true subcutaneous puncture.

It is a common practice of mine to let out the fluid from distended joints—most frequently the knee and hip joints—at a comparatively early stage, by passing a long tenotomy knife under the skin and opening the joint at least an inch from the cutaneous puncture. I do not withdraw the knife till all the fluid has escaped, but use it as a conductor for the fluid, which, even if curdy or containing shreds of lymph, will escape along the knife, if the latter be occasionally twisted and manipulated. A pad of lint and a firm bandage are then applied. By this operation, great relief is afforded to the patient, and long-continued poulticing avoided. The wound generally heals by the third day, without a blush of inflammation; and if the joint refills, the same plan must be repeated. Sometimes adhesion fails, when pus continues to escape through the canal, and a fistulous opening is established; but then the tedious process of pointing and spontaneous opening, with the poulticing treatment, is avoided. I have not seen any inflammation excited by this subcutaneous puncture. The plan is equally applicable to psoas and lumbar abscess.

All the operations which I have arranged in this class hold some relation to the inflammatory process, when it already exists, and have for their object either to arrest or modify its progress, or to avert some of its most troublesome and unfavourable consequences. Many of these operations, especially when applied to joints, or serous cavities, would be dangerous, either

to the limb or life of the patient, if performed by open wound.

Closely allied to the true subcutaneous operations which we have been considering, may be mentioned a series of operations which hold an intermediate position between subcutaneous and open wounds—operations which cannot be performed subcutaneously, but are performed by open wound in a manner so as to approach the subcutaneous method, and with the view of combining as many of the advantages of this plan as possible. They may be described as OPEN WOUNDS QUICKLY CLOSED. The first principle of treatment in all incised and some lacerated wounds, is to bring the surfaces in contact, and thus prevent the *continued exposure to the air*. By so doing, we know that severe inflammation, and especially suppuration, is commonly prevented; generally, only a very slight amount of inflammation follows, and adhesion is produced. Compound fractures are sometimes brought into conditions as favourable as simple fractures by the same means. And the recommendation of Stromeyer to treat the compound fractures of the skull with depressed bone in the same way, instead of trephining, has already been noticed.

Now, there are some surgical operations, necessarily performed by open wound, in which the security of the patient, and the favourable termination of the case, depend very much upon the short time which the divided parts are exposed to the air; and these I



propose to arrange in the class we are now considering, under the head of OPEN WOUNDS QUICKLY CLOSED.

*Ex. 1.* The operation for extraction of cataract, in which the large open wound in the cornea is immediately closed. Let it not be supposed that I have any intention of asserting that the short time which the internal structures of the eye are exposed to the influence of the air, in this operation, is the only, or even the chief, cause of its success, as this would be measured by any statistical report—the extreme delicacy of manipulation and refinement of operative skill required to insure success in the operation for extraction of cataract, are universally admitted;—but I believe this to be the explanation of the slight degree, if indeed it may not be said the complete absence, of inflammation, which generally follows this operation, when performed with the requisite skill and dexterity.

*Ex. 2.* Another operation belonging to this intermediate class between open and subcutaneous wounds, is the improved method of extirpating the globe of the eye, now generally adopted at the Moorfields Ophthalmic Hospital, and first practised in this country by Mr. Critchett, in October, 1851\*. Instead of dissecting out the contents of the orbit, as in

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\* Described by Mr. Critchett, in "The Lancet" of November 17th and 24th, 1855. Mr. Critchett states that this operation was first suggested by O'Ferrall, in 1841, in the Dublin Journal; and by Bonnet, in 1842, in Annales d'Oculistique; but he was not aware of these facts when he proposed the operation.

the old operation, and leaving a large open wound, necessarily followed by suppurative inflammation, which has frequently proved fatal, Mr. Critchett removes the eye-ball alone, through a circular aperture in the conjunctiva, close to the cornea. The muscles and optic nerve are easily detached from the globe. Mr. Critchett observes: "The conjunctiva falls back and forms a moveable curtain or diaphragm, and unites at once, thus shutting in all the parts that have been cut, and perfectly excluding the air."... "I do not hesitate to rank this procedure, formerly deemed so severe, amongst the simplest and safest operations of surgery." Little or no inflammation follows, and an artificial eye can be adapted in three or four days. In a recent note to me on this subject, Mr. Critchett remarks: "I saw a man to-day for whom I extirpated a globe this day week; he has already worn an artificial eye for three days, and with perfect comfort; and this is not an exceptional, but a uniform result." This observation is confirmed by the accompanying note, from the official Report of the operations performed in the Ophthalmic Hospital\*.

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\* In a "Report of Operations performed at Moorfields Ophthalmic Hospital, from the 21st of April, to the 25th of June, 1857," published in the Medical Times and Gazette for July 11th, 1857, is the following statement:

"EXCISION OF THE EYE-BALL—12 Cases. The operation is performed as usual by separation of the conjunctiva close to the cornea, division of the tendons of the muscles separately, and of the optic nerve. The necessary instruments are, an eye-speculum, a forceps, one pair of curved scissors, and a strabismus-hook. The operation, as a rule, lasts from three to five minutes, and the patients leave the Hospital in a few days, many of them being able to wear an artificial eye on the third day after the operation."

The operations for the extraction of cataract, and the removal of the globe of the eye, may then be taken as examples of a class of operations, the favourable termination of which very much depends upon the short time which the divided parts are exposed to the air, and may therefore be arranged as an intermediate class between subcutaneous and open wounds—open wounds quickly closed.

I have now, Mr. President and Gentlemen, endeavoured to illustrate the truth of Hunter's observation with respect to the difference, in the liability to inflammation and suppuration, between open and subcutaneous wounds; and to give such physiological and pathological explanations of the observed phenomena as recent investigations afford.

In considering the practical application of the law which governs the reparative process in these classes of injuries, I have endeavoured to prove that the surgeon can bring many open wounds, the result of accidental injuries, more or less perfectly into the condition of subcutaneous wounds; and in the same proportion diminish the risk of the more serious inflammatory complications, such as suppuration and pyæmia. I adduced, in illustration, the treatment of incised and some lacerated wounds; the treatment of burns; of compound fracture, according to the method of Mr. Bennion; and even of compound fracture of the skull with depressed bone, according to the plan recommended by Stromeyer.

I have also endeavoured to prove the extended

application of the subcutaneous law to the practice of operative surgery, and in so doing have briefly alluded to a large number of operations in surgery which are evidently governed by the same general law; and the successful termination of which mainly depends upon the exact appreciation the surgeon may have of the several conditions necessary to the success of subcutaneous operations, and the advantages of what has been called by M. Guérin "the subcutaneous method." None of these operations can be performed with reliable safety, if performed by open wound and continued exposure to the air.

In further illustration of the general truth of the HUNTERIAN LAW of the reparative process in subcutaneous and open wounds, I have also adduced the successful results of certain operations which cannot be performed subcutaneously, but are performed by open wounds in a manner so as to obtain many of the advantages of the subcutaneous method.

In very many surgical operations, it is true that the surgeon has no choice with respect to the mode of procedure, whether by open or subcutaneous wounds; but, in many instances, modern surgery has proved that the old plan of open wound can be advantageously superseded by the subcutaneous method; and operations, which but a few years or months since were constantly performed by open wound, are now being done subcutaneously.

I have especially endeavoured to show that, by observing the law pointed out by Hunter, the surgeon can, in many operations, so adapt his mode of pro-

cedure as to prevent or regulate the degree of inflammation which might be expected to follow an operation; in fact, that, in no small or unimportant degree, he is enabled to establish the conditions which influence or direct the reparative process in wounds according to one or other of the various processes of healing.

1st. He can perform many operations in the most delicate and important regions so that no inflammation may follow; such as the subcutaneous operation for the removal of loose cartilages; the section of articular ligaments for the reduction of dislocations, the cure of distortions, &c.; the needle operations for cataract, drilling, &c.; the evacuation of the fluid contents of cavities; the freeing of depressed cicatrices, &c. And, with the object of avoiding inflammation, he is also enabled to combine the object of promoting the development of a new connective tissue, where this is necessary to the restoration of function; as in tenotomy and myotomy.

2nd. He can avoid excessive inflammation when its occurrence in some degree cannot be prevented, as in the method of "forced rupture," or forcible extension of partially ankylosed joints; the operation for hernia without opening the sac; &c.

3rd. When a limited amount of inflammation is necessary to the reparative process, he can purposely excite it and regulate its intensity, not with absolute certainty, but to a great extent, and generally so as to avoid the dangers of suppuration and pyæmia; as in the various operations for ununited fracture; the

several methods of obliterating serous cavities, as in hydrocele, bursæ, &c. by the introduction of foreign substances and other operative procedures; as in Wützer's operation for the radical cure of hernia, &c.; the various operations for obliterating varicose veins; the cure of nævi; the obliteration of fistulous canals by subcutaneous ligature; &c.

4th. When inflammation already exists, he can, by subcutaneous operations, sometimes arrest the inflammatory process, or avert some of its most troublesome and unfavourable consequences; such as the painful tension of certain structures, the formation of external fistulous openings, the extreme distension of cavities, &c. Of these results we have examples in the subcutaneous incisions for the relief of pain in inflamed periosteum; the subcutaneous method of opening bubo; and also other abscesses, such as the psoas and lumbar abscess; the relief of distended serous cavities, as in pleuritis, &c.; and also of distended joints.

5th. He can so modify the mode of procedure in certain operations, which must necessarily be performed by open wounds, as to limit the inflammation which might be expected to follow, or in some instances entirely to prevent its occurrence. In these operations, continued exposure to the air is avoided, and therefore I have described them as "open wounds quickly closed." The operation of extraction for cataract, and the improved method of removing the globe of the eye, are good examples of this series.

It is undoubtedly true. that many of the subcu-

taneous operations which I have described have not been adopted as the result of a knowledge of *the subcutaneous law* which governs the reparative process, but have been slowly arrived at by the practical suggestions of surgeons who have observed certain effects, without tracing these effects to their causes.

However, there can be no doubt that a more general knowledge of this law of subcutaneous wounds would have led surgeons to the earlier performance of these operations, many of which may undoubtedly be ranked amongst the greatest triumphs of modern surgery. Therefore I am not without a hope that the present attempt to bring this law, in its pathological and practical bearings, more thoroughly under the notice of the members of this society, may still further promote its scientific and practical application in the various departments of surgery. And in so doing, it cannot fail to increase the veneration we feel towards that great "interpreter of nature," John Hunter, to whom we are indebted for the discovery of this and other general laws, the knowledge of which has raised the practice of surgery from a mere empirical art to the dignity and importance of a science, in the most general and comprehensive meaning of the word, and in the same proportion has entitled the practitioners of surgery to be ranked as members of a scientific and liberal profession.

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## APPENDIX.

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### NOTE I. (Page 25.)

EXPERIMENTS PERFORMED BY DR. SNOW AND MR. ADAMS, TO PROVE THE INFLUENCE OF DIFFERENT GASES AND VAPOURS IN EXCITING OR ALLAYING PAIN, WHEN APPLIED TO A BLISTERED SURFACE.

Where the experiments above adverted to as having been performed by Ingen-Housz are recorded, Dr Snow was not able to inform me. They have been recently alluded to by Vigla, in "*Journal de Pharmacie et de Chemie*" for April, 1857, page 307, in an article on Anesthesia, by Amylene, &c. In the absence of the exact account of these experiments, I agreed with Dr. Snow to repeat them; and, on the 27th of May, applied a blister, the size of half-a-crown, on the outer side of my left arm; and, on the 28th, the experiments were conducted by Dr. Snow, and the subjoined description written out by him from my account of the effects produced by the gases and vapours employed.

May 28th, 1857. The cuticle was stripped off from the small blister which had been raised in the arm, and the raw and inflamed surface was consequently exposed to the air; a sensation of smarting, heat, and pricking was felt.

The blistered part was covered with a small glass jar, into which nitrogen gas was introduced from another jar, communicating with it by means of a stop-cock and an elastic tube. In two or three minutes the smarting and pricking were removed; a sensation of comfortable warmth was experienced when the attention was directed to it, but at other times, there was hardly any sensation. The nitrogen was applied for twelve minutes, and the relief continued to the end of the application.

The nitrogen gas was then displaced by oxygen from another jar. There was a little return of pricking at the moment when the oxygen



was introduced. The oxygen was continued for ten minutes, during which time the pricking and warmth remained. The glass being removed, a current of oxygen was applied from the end of a tube, and the part smarted a little more after this. The oxygen was applied again in the jar ; it occasioned a sensation of heat to discomfort, without smarting or pricking.

After the blistered part had been exposed for a short time to the common air, hydrogen gas was applied in a jar, in the same manner as the other gases ; in three minutes, the smarting and pricking diminished,

After the blistered surface had again been exposed to the air for a short time, carbonic acid gas was applied. It caused decided increase of smarting, which changed to a sense of heat. In three minutes, the smarting was quite gone, and the heat had subsided to a gentle warmth.

The above experiments confirm the observations of Ingen-Housz. They show that nitrogen, hydrogen, and carbonic acid gases relieve and prevent the smarting which atmospheric air causes in an abraded surface ; the last of these gases, however, having an irritant effect in the first instance, before its soothing or narcotic influence is developed. Pure oxygen gas seemed to cause somewhat more pain than atmospheric air.

Ten hours after the previous experiments, the dressing—cold cream, which had been applied after the first series of experiments—was removed from the blistered part ; there was no smarting from exposure to the air.

Vapour of amylene was applied to the part, by means of a cupping glass containing a piece of blotting paper wetted with the liquid. A minute after the application of the vapour, slight burning and smarting began, and continued till the removal of the vapour, at the end of five minutes. After its removal, the part became easy.

Chloroform vapour was applied in the same manner. Severe smarting commenced within a minute, and continued to increase for about five minutes. The smarting then began to diminish ; but a burning sensation remained all the time the chloroform vapour was applied—viz. for twenty minutes. The glass was once or twice removed for half a minute to renew the chloroform, and at these times

the surface of the sore was touched with the finger, and distinct sensation was found to be present. After the removal of the chloroform, the blistered surface soon became easy, although exposed to the air.

Chloroform vapour was again applied for two or three minutes, so as to cause smarting, and carbonic acid gas was applied. The smarting quickly subsided during the application of the carbonic acid.

Oxygen gas was applied a few minutes after the carbonic acid. The part was easy before oxygen was applied, but this gas occasioned a slight burning sensation.

Nitrogen was applied soon after the oxygen, when the burning was already decreasing. It continued to decrease under the application of nitrogen; but the effect of this gas was not very evident, as the pain was decreasing before it was applied.

## NOTE II. (Page 34.)

*(From the Medical Times and Gazette, July 11th, 1857.)*

### ON THE SUBCUTANEOUS REMOVAL OF LOOSE CARTILAGE FROM THE KNEE-JOINT, BY W. J. SQUARE, ESQ. SURGEON TO THE DEVON AND EAST CORNWALL HOSPITAL.

Having witnessed a death and an amputation of the thigh as results of operations for the removal of loose cartilages from the knee-joint, I relate with pleasure a case of this description cured by subcutaneous incision, and the subsequent excision of the loose cartilages.

James Ellis, aged 33 years, a farm-servant, was admitted into the South Devon and East Cornwall Hospital on December 3rd, 1856. He has been more or less lame for eighteen years, and during the last year has been almost incapable of work. He has felt the two foreign bodies in the joint for fifteen years. At first small, they have gradually increased in size. The right knee-joint is somewhat larger than the left, and two foreign bodies are readily felt in it. One seems as large as a walnut; the other, as a common hedge-nut. By displacement in walking, they cause excessive and sudden pain; and his lameness and distress are often increased by effusion into the joint.

*Operation, December 8, 1857.* Having pushed them into the upper and outer part of the joint, I entrusted them to Mr. Whipple, who kept them firmly fixed in that position; I then made two subcu-

taneous incisions on the outer aspect of the thigh, with a long, straight tenotomy knife. The first, about five inches above the knee, the knife being moved semi-circularly to separate the cellular tissue from the fascia; the second, two inches above the joint, by which the subcutaneous separation of cellular tissue was continued down as far as the cartilages, and the joint opened by cutting vertically upon them. This accomplished, I lifted them from their position with the point of the knife, and slid them along the cellular tract eight inches up the thigh. Compresses were then placed along the tract of the subcutaneous wound, a bandage applied, and a straight splint along the back of the limb.

22nd. No inflammation or other symptoms having followed this operation, I on this day removed the two cartilages by a vertical incision.

30th. Some stiffness of the joint remains. Discharged cured.

The cartilages are of yellow, waxy aspect, and are composed of bone and cartilage, with a predominance of the former. They appear to be covered by a fine membrane, and are highly polished.

Surgery is ever on the advance. Conservative surgery has of late been studied and practised with the happiest results. Operations which experience has proved to be dangerous have been superseded by others, attended with less risk to limb and life.

Among these may be ranked the removal of loose cartilages from the knee and other joints by the subcutaneous method. I believe that I am correct in stating that M. Goyrand, of Aix, was the first surgeon who proposed this operation. His example was speedily followed by the late Mr. Liston, who modified the plan of M. Goyrand, by allowing the foreign body to remain in the cellular tissue in which it is imbedded. He found that its presence caused no inconvenience to the patient, and that it gradually decreased in size.

I presume that this plan is only feasible when the cartilage is small, and not bony in structure. Mr. Syme also at once recognised the value of the operation, and adopted it with Mr. Liston's modification. Many other surgeons have performed it, and with good success.

I publish my case, therefore, as an appendix to many which have preceded it, and as a unit in the sum total to increase the repute of a valuable addition to surgical science.

Plymouth.

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(*From the Medical Times and Gazette, August 1st, 1857.*)

PROFESSOR SYME AND MR. SQUARE ON THE SUBCUTANEOUS  
REMOVAL OF LOOSE CARTILAGES.

[To the editor of the Medical Times and Gazette.]

SIR,—I shall be obliged by your publishing the following extract from a letter addressed to me by Professor Syme, dated July 13, 1857:—"With reference to what you say in the *Medical Times and Gazette* of Saturday last as to my having adopted the subcutaneous method of removing cartilaginous bodies at the suggestion of Mr. Liston, and with a modification proposed by him, I beg to inform you that this operation was an original idea of my own, and was communicated by me to Mr. Liston, before any account of M. Goyrand's procedure had reached this country. During a temporary estrangement which happened between us subsequently, Mr. Liston published a letter to Sir P. Crampton, giving the sole merit to M. Goyrand. But in the *Edinburgh Monthly Journal* for March, 1841, and in my contributions to the Pathology and Practice of Surgery, published in 1847, at page 282, you will find an account of my first operation, which was performed in the Royal Infirmary, on February 1, 1841."

It appears from this extract that Professor Syme first conceived the idea and performed the operation; and to him, therefore, the claim of originality is justly due.—I am, &c.

WILLIAM JOHN SQUARE,

Surgeon to the South Devon and East Cornwall Hospital.  
Plymouth, July 25, 1857.

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(*From the Medical Times and Gazette, August 22nd, 1857.*)

PROFESSOR SYME'S CLAIM TO THE OPERATION OF REMOVING  
LOOSE CARTILAGES BY SUBCUTANEOUS INCISION.

[To the Editor of the Medical Times and Gazette.]

SIR,—In the *Medical Times and Gazette*, 1st August, 1857, Mr. Square, of Plymouth, has published an extract from a letter addressed to him by Professor Syme, of Edinburgh, in which Mr. Syme claims the originality of suggesting and performing the subcutaneous operation for the removal of loose cartilages; an operation of great practical importance, because by it a perfectly harmless procedure (when the conditions necessary to prevent inflammation in subcutaneous operations are fulfilled) is substituted for a very dangerous operation, which has

been fatal in many instances. It is also an operation of scientific interest, as a most important application of the subcutaneous method.

Mr. Syme, in the letter above referred to, says, "I beg to inform you that this operation was an original idea of my own, and was communicated by me to Mr. Liston before any account of M. Goyrand's procedure had reached this country. . . . In the *Edinburgh Monthly Journal* for March, 1841, you will find an account of my first operation, which was performed in the Royal Infirmary, on February 1, 1841."

Now, Sir, in "A Sketch of Subcutaneous Surgery," which I am about publishing, I have endeavoured to trace the history of the numerous subcutaneous operations, which are undoubtedly amongst the greatest improvements of modern surgery; and I have assigned the credit of the subcutaneous operation for the removal of loose cartilages to M. Goyrand, upon the following evidence:

M. Goyrand published an account of his first operation in "*Les Annales de la Chirurgie Française et Etrangère*," vol. i, page 63, Paris, 1841. In relating the case, M. Goyrand tells us that the patient was admitted into the Hospital of Aix on the 14th September, and that the operation was performed on the 22nd September; but, by a singular omission, he does not state the year. This omission, however, is quite covered by the advertisement on the fly-leaf page of the book, which runs as follows:—" *Conditions de l'abonnement*: Les Annales de la Chirurgie Française et Etrangère seront publiées tous les premiers du mois, à partir de Janvier, 1841."

If, therefore, this book was published on the 1st January, 1841, as the advertisement would lead us to infer, it is evident that M. Goyrand's operation was performed in September, 1840, or at least not later than that date, which would place it five months previous to that of Professor Syme.

I had given the credit to Goyrand mainly on the authority of M. Guérin, who relates Goyrand's case in a note at the end of his "*Essais sur la Méthode Sous-cutanée*." This book was published in the year 1841, but probably quite in the beginning of the year, as the introduction is dated "Paris, le 1er Décembre, 1840;" and M. Guérin remarks, that at the moment of completing his task he received the first number of the "*Annales de la Chirurgie Française et Etrangère*," previously referred to.

From this evidence, I think it perfectly clear that the September

in which M. Goyrand performed this operation was in the year 1840, or not later than that year, though in his own account he has omitted the full date.

I have no reason or desire to doubt the accuracy of Mr. Syme's statement, that the operation was an original idea of his own. Instances in which great discoveries in science have been almost simultaneously made by good observers in different countries are sufficiently familiar ; but still I am anxious to relate in detail the proof that M. Goyrand performed the subcutaneous operation for the removal of loose cartilages, for the idea of which he states he was indebted to M. Guérin, in the month of September, 1840, five months before the operation performed by Mr. Syme ; and that M. Goyrand's operation was published on the 1st January, 1841, in the first number of "*Les Annales de la Chirurgie Française et Etrangère*."

It was also published very early in the year 1841 by M. Guérin, probably in January, as the introduction to his *Essais* is dated December 1, 1840 ; so that it would seem that sufficient time had elapsed for the operation to have reached this country before its performance in Edinburgh.

I am, etc. WM. ADAMS.

Henrietta Street, Cavendish Square,  
8th August, 1857.

---

#### ADDITIONAL NOTE BY THE AUTHOR.

We learn from M. Guérin that the first step in advance from the original method of removing loose cartilages by open wound, first adopted by A. Paré—occasionally with success, but frequently with fatal results—was made by M. Dupresse Chassaigne,\* who adopted the plan of dislodging the loose cartilage from the cavity of the articulation by a subcutaneous incision, and leaving it embedded in the cellular tissue external to the joint, where it remained, without giving rise to further inconvenience.†

M. Guérin relates a case of loose cartilage in the knee-joint,

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\* *Essais sur la Méthode sous-cutanée*. Paris, 1841, page 101 to 113.

† A mode of procedure essentially similar to that claimed by Mr. Liston as his modification of Goyrand's operation, but evidently performed by Chassaigne with greater regard to the rules of subcutaneous surgery. For an account of Mr. Liston's operation, see *Dublin Quarterly Journal*, vol. iii, 1847, page 35.

operated upon by Dupresse Chassaigne, in May, 1840, in which, after having fixed the loose cartilage between the index finger and thumb, he says: "I thrust a fine cataract needle under the skin, tore the capsule quite round the loose cartilage, withdrew the instrument, and fixed the parts in the state in which I put them with sticking-plaster, which I tightened round the foreign body covered by the skin. Afterwards, I applied a bandage round the limb, from the foot to the knee, kept it extended, and left it for eight days. After the lapse of this time, I found the cartilage adherent in the place where I had fixed it."

The procedure above described was indeed an important step in advance, and is adverted to by M. Guérin in terms of the highest commendation. M. Guérin himself proposed to remove the loose cartilage by subcutaneous incision at one operation.\* His plan was to fix the loose cartilage in a convenient situation, and then, having taken up a large fold of the skin and drawn it on one side, to cut down directly upon the cartilage and remove it, afterwards replacing the skin, so that there would be no correspondence between the external and internal incisions. M. Guérin, however, bears a willing and graceful testimony to the superiority of the procedure recommended by M. Goyrand, to whom the credit is due for having perfected this operation upon the true principles of subcutaneous surgery, by first removing the loose cartilage from the cavity of the articulation by a subcutaneous incision, and retaining it by means of a bandage in the cellular tissue, and then, after an interval of ten or twelve days, when complete closure of the incision into the joint had taken place, removing the loose cartilage at a second operation. This method, when adopted with the precautions necessary to the success of all subcutaneous operations, appears to be entirely free from the risk of inflammation; and a case better illustrative of this fact could not be adduced than that treated by Mr. Square, of Plymouth, above quoted. M. Goyrand first published his method of performing this operation, for the idea of which he acknowledges his obligation to the principles of subcutaneous surgery taught by M. Guérin, in "*les Annales de la Chirurgie Française et Etrangère*," No. 1, p. 63; and this account is quoted by M. Guérin, in his "*Essais sur la Méthode sous-cutanée*," p. 119. M. Goyrand first dislodged the

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\* Op. cit. page 112.

† Paris, January 1841.

loose cartilage in the case recorded on the 22nd of September, 1840, and completed its extraction by a second operation on the 8th October, 1840.

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NOTE III. (Page 45.)

ON THE SUBCUTANEOUS DIVISION OF VARICOSE VEINS,  
PROPOSED BY SIR BENJAMIN BRODIE.

Sir Benjamin Brodie, in his "Lectures on Pathology and Surgery,"\* relates the practice recommended by Sir Everard Home, which he frequently witnessed, of applying a ligature by means of an open wound to the Saphena vein; and refers to several cases of death, and others in which venous inflammation, attended by typhoid symptoms supervened. Sir Benjamin afterwards tried the plan recommended by Mr. Abernethy, of cutting the vein across by open wound and applying pressure; the object being to avoid the ligature, to which Abernethy attributed the inflammation: venous inflammation followed, and the man died in four days. Sir Benjamin then describes an operation which he suggested, of dividing a cluster of varicose veins by subcutaneous incision. He used a very narrow bistoury, cutting on the convexity. He states: "I punctured the skin on one side of the varicose cluster; carried the blade under the skin, between it and the varicose veins, over to the other side; and, having carefully performed this part of the operation, the skin remaining entire, except where the first puncture was made, I turned the edge of the instrument backwards, and, drawing it out, cut across the varicose cluster." Pressure was afterwards applied. "The varicose veins were obliterated; and usually in a few days the patient suffered no inconvenience from the operation." He further remarks: "I published, in the *Medico-Chirurgical Transactions*, an account of this operation, in the year 1816; † and I believe that it affords the first example of the subcutaneous operation, which is now so successfully employed in other cases. As applied to varicose veins, the operation is as easy and safe as it is on other occasions." Sir Benjamin states that occasionally this subcutaneous division failed to obliterate the veins; an additional illustration of the immunity from inflammation enjoyed by true subcutaneous operations.

---

\* London, 1846.

† *Medico-Chirurgical Transactions*, vol. vii, 1816.



Sir B. Brodie then alludes to the plan of subcutaneous ligature, as it is sometimes called, by passing a pin beneath the vein, and applying a twisted suture externally round the ends of the pin, so as to compress the vein sufficiently to produce its obliteration, between the pin and the suture, as "lately adopted by M. Velpeau, of Paris."

It is worthy of remark that this operation of subcutaneous division of varicose veins, proposed by Sir B. Brodie, though rarely adopted in practice at the present day, has not been discontinued on account of any risk or unfavourable results attending it. An occasional failure to obliterate the vein, and in some instances suppuration of the wound, "which protracted the cure," are the only unfavourable results recorded. The reason assigned by Sir B. Brodie for discontinuing the operation equally apply to the other methods in use. He observes: "I scarcely ever have recourse to it now. With my present experience, it really appears to me that, in ordinary cases, it is not worth the patient's while to submit to it; as I always observed that, if I cured one cluster, two smaller ones appeared, one on each side, and that, ultimately, I left the patient no better than I found him. The operation, however, is proper where there is a varicose cluster much distended, and liable to burst and bleed. Here you may save the patient's life by having recourse to it; and you may do so without considering whether fresh clusters are or are not likely to form afterwards."

THE END.

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# A CLASSIFIED INDEX

TO

## MR. CHURCHILL'S CATALOGUE.

### ANATOMY.

	PAGE
Anatomical Remembrancer ..	3
Beale on Liver ..	4
Hassall's Micros. Anatomy ..	14
Holden's Human Osteology ..	15
Jones' and Sieveking's Patho- logical Anatomy ..	17
MacLise's Surgical Anatomy ..	19
Paget's Catalogue ..	21
Sibson's Medical Anatomy ..	25
Toynbee's Catalogue ..	28
Wheeler's Handbook ..	30
Wilson's Anatomy ..	31

### CHEMISTRY.

Abel & Bloxam's Handbook ..	4
Bowman's Practical Chemistry ..	7
Do. Medical do. ..	12
Fownes' Manual of Chemistry ..	12
Do. Actonian Prize ..	12
Do. Qualitative Analysis ..	12
Do. Chemical Tables ..	12
Fresenius' Chemical Analysis ..	12
Galloway's First Step ..	12
Do. Analysis ..	12
Do. Diagrams ..	12
Griffiths' Four Seasons ..	13
Horsley's Chem. Philosophy ..	16
Jones—Mulder on Wine ..	17
Odling's Practical Chemistry ..	21
Plattner on Blowpipe ..	22
Speer's Pathol. Chemistry ..	25

### CHOLERA.

Acland on Cholera at Oxford ..	3
Baly and Gull—Reports ..	4
Snow on Cholera ..	25

### CLIMATE.

Francis on Change of Climate ..	12
Hall on Torquay ..	14
Haviland on Climate ..	15
Lee on Climate ..	18
Martin on the Undercliff ..	19
Martin (J. R.) on Tropical ..	20

### DEFORMITIES, &c.

Bishop on Deformities ..	6
Do. Articulate Sounds ..	6
Brodhurst on Spine ..	7
Do. on Clubfoot ..	7
Hare on Spine ..	14
Inman on Spine ..	16
Tamplin on Spine ..	27

### DENTISTRY.

	PAGE
Blundell's Painless Extraction ..	6
Clark's Odontalgist ..	8
Gray on the Teeth ..	13

### DISEASES of the URINARY and GENERATIVE ORGANS, and SYPHILIS.

Acton on Reproductive Organs ..	3
Do. Urinary and Genera- tive Organs ..	3
Coote on Syphilis ..	9
Coulson on Bladder ..	10
Do. on Lithotomy ..	10
Egan on Syphilis ..	11
Judd on Syphilis ..	17
Milton on Gonorrhœa ..	20
Parker on Syphilis ..	22
Todd on Urinary Organs ..	28
Wilson on Syphilis ..	31

### DISEASES OF WOMEN AND CHILDREN.

Bennet on Uterus ..	5
Do. on Uterine Pathology ..	5
Bird on Children ..	6
Brown on Women ..	7
Do. on Scarlatina ..	7
Eyre's Practical Remarks ..	11
Hood on Crowing ..	16
Lee's Ovarian and Uterine Dis- eases ..	18
Lee on Diseases of Uterus ..	18
Robertson on Women ..	24
Rowe on Females ..	24
Smith on Leucorrhœa ..	25
Tilt on Diseases of Women ..	27
Do. on Change of Life ..	27
Underwood on Children ..	28
West on Women ..	29
Whitehead on Abortion ..	30

### HYGIENE.

Beale's Laws of Health ..	5
Do. Health and Diseases ..	5
Blundell's Medicina Mechanica ..	6
Carter on Training ..	8
Cornaro on Long Life ..	9
Hartwig on Sea Bathing ..	14
Do. Physical Education ..	14
Hufeland's Art ..	16
Lee's Watering Places of England ..	18
Do. do. Germany, France, and Switzerland ..	18
Lee's Rhenish Watering Places ..	18
Robertson on Diet ..	23
Roth on Movements ..	24
Rumsey's State Medicine ..	24
Van Oven's Decline of Life ..	29
Wilson on Healthy Skin ..	31
Do. on Mineral Waters ..	31

### MATERIA MEDICA and PHARMACY.

	PAGE
Bateman's Magnacopia ..	4
Beasley's Formulary ..	5
Do. Receipt Book ..	5
Do. Book of Prescriptions ..	5
Lane's Materia Medica ..	17
Pereira's Selecta e Præscriptis ..	22
Pharmacopœia Londinensis ..	22
Prescriber's Pharmacopœia ..	22
Royle's Materia Medica ..	24
Spurgen's Materia Medica ..	26
Squire's Pharmacopœia ..	26
Steggall's Materia Medica ..	26
Do. First Lines for Chemists ..	26
Stowe's Toxicological Chart ..	26
Taylor on Poisons ..	27
Wittstein's Pharmacy ..	31

### MEDICINE.

Adams on Rheumatic Gout ..	4
Addison on Cells ..	3
Alexander on Rheumatism ..	3
Arnott on a Local Anæsthetic ..	3
Barclay on Diagnosis ..	5
Barlow's Practice of Medicine ..	4
Billing's First Principles ..	5
Bird on Charcoal ..	6
Brinton on Ulcer ..	7
Budd on the Liver ..	7
Do. on Stomach ..	7
Chambers on Digestion ..	8
Davey's Ganglionic ..	10
Eyre on Stomach ..	11
Fuller on Rheumatism ..	12
Gairdner on Gout ..	12
Garrett on E. and N. E. Winds ..	13
Granville on Sudden Death ..	13
Gully's Simple Treatment ..	13
Habershon on Stomach ..	14
Hall on Apnoea ..	14
Hall's Observations ..	14
Harrison on Lead in Water ..	14
Headland on Medicines ..	15
Hooper's Medical Dictionary ..	16
Hooper's Physician's Vade- Mecum ..	13
Jones (H.) on the Stomach ..	16
Lugol on Scrofula ..	19
Peacock on Influenza ..	22
Pym on Yellow Fever ..	23
Robertson on Gout ..	23
Savory's Compendium ..	24
Semple on Cough ..	24
Shaw's Remembrancer ..	25
Steggall's Medical Manual ..	26
Do. Gregory's Conspectus ..	26
Do. Celsus ..	26
Thomas' Practice of Physic ..	27
Wegg's Observations ..	29
Wells on Gout ..	30
What to Observe ..	19
Whitehead on Transmission ..	30
Williams' Principles ..	30
Wright on Headaches ..	30

# CLASSIFIED INDEX.

## MISCELLANEOUS.

	PAGE
Acton on Prostitution .. ..	3
Atkinson's Bibliography .. ..	4
Bascome on Epidemics .. ..	4
Bryce on Sebastopol .. ..	8
Cooley's Cyclopaedia .. ..	9
Forbes' Nature and Art in Disease ..	12
Gully on Water Cure .. ..	13
Guy's Hospital Reports .. ..	13
Lane's Hydropathy .. ..	18
Marcet on Food .. ..	19
Massy on Recruits .. ..	20
Oxford Editions .. ..	21
Part's Case Book .. ..	22
Pettigrew on Superstitions .. ..	22

## NERVOUS DISEASES AND INDIGESTION.

Anderson on Nerves Affections ..	3
Arnott on Indigestion .. ..	3
Carter on Hysteria .. ..	8
Child on Indigestion .. ..	8
Downing on Neuralgia .. ..	11
Hunt on Heartburn .. ..	16
Lobb on Nervous Affections .. ..	19
Radcliffe on Epilepsy .. ..	23
Reynolds on the Brain .. ..	23
Rowe on Nervous Diseases .. ..	24
Sieveling on Epilepsy .. ..	25
Todd on Nervous System .. ..	28
Turnbull on Stomach .. ..	28

## OBSTETRICS.

Barnes on Placenta Prævia .. ..	4
Copeman's Records .. ..	9
Crosse's Midwifery .. ..	10
Lee's Clinical Midwifery .. ..	18
Pretty's Aids during Labour .. ..	23
Ramsbotham's Obstetrics .. ..	23
Do. Midwifery .. ..	23
Smellie's Obstetric Plates .. ..	25
Smith's Periodoscope .. ..	25
Swayne's Aphorisms .. ..	26

## OPHTHALMOLOGY.

Cooper on Near Sight .. ..	9
Dalrymple on Eye .. ..	10
Dixon on the Eye .. ..	11
Holthouse on Strabismus .. ..	15
Do. on Impaired Vision .. ..	15
Jacob on Eye-ball .. ..	16
Jones' Ophthalmic Medicine .. ..	17
Do. Defects of Sight .. ..	17
Do. Eye and Ear .. ..	17
Nottingham on Conical Cornea ..	20
Walton on Ophthalmic .. ..	29

## PHYSIOLOGY.

	PAGE
Carpenter's Human .. ..	8
Do. Comparative .. ..	8
Do. Manual .. ..	8
Cottle's Human .. ..	10
Hilton on the Cranium .. ..	15
Richardson on Coagulation .. ..	23

## PSYCHOLOGY.

Burgess on Madness .. ..	7
Burnett on Insanity .. ..	7
Conolly on Asylums .. ..	9
Davey on Nature of Insanity ..	10
Flood on Criminal Lunatics .. ..	16
Jacobi on Hospitals, by Tuke .. ..	28
Knaggs on Criminal Lunatics ..	17
Millingen on Treatment of In-	
sane .. ..	20
Monro on Insanity .. ..	20
Do. Private Asylums .. ..	20
Noble on Psychology .. ..	20
Williams (J.) on Insanity .. ..	30
Williams (J. H.) Unsoundness of	
Mind .. ..	30
Winslow's Lettsomian .. ..	31
Do. Law of Lunacy .. ..	31

## PULMONARY and CHEST DISEASES, &c.

Addison on Healthy and Dis-	
eased Structure .. ..	3
Billing on Lungs and Heart .. ..	5
Blakiston on the Chest .. ..	6
Bright on the Chest .. ..	7
Cotton on Consumption .. ..	10
Do. on Stethoscope .. ..	10
Davies on Lungs and Heart .. ..	11
Fenwick on Consumption .. ..	11
Laennec on Auscultation .. ..	17
Madden on Consumption .. ..	19
Markham on Heart .. ..	20
Richardson on Consumption ..	23
Skoda on Auscultation .. ..	19
Thompson on Consumption .. ..	27
Wardrop on the Heart .. ..	29
Weber on Auscultation .. ..	29

## RENAL DISEASES.

Addison on Supra-Renal Capsules	4
Bird's Urinary Deposits .. ..	6
Jones' Animal Chemistry .. ..	17

## SCIENCE.

	PAGE
Beale on Microscope .. ..	4
Beale's How to Work .. ..	4
Bird's Natural Philosophy .. ..	6
Burnett's Philosophy of Spirits ..	7
Carpenter on Microscope .. ..	8
Garner's Eutherapeia .. ..	13
Hardwich's Photography .. ..	14
Hinds' Harmonies .. ..	15
Holland on Appendages .. ..	15
Jago on Ocular Spectres .. ..	16
Jones on Vision .. ..	17
Mayne's Lexicon .. ..	19
Nourse's Students' Tables .. ..	21
Reymond's Animal Electricity ..	23
Schacht on Microscope .. ..	24
Taylor's Medical Jurisprudence ..	27
Vestiges of Creation .. ..	28
Sequel to ditto .. ..	28
Unger's Botanical Letters .. ..	28

## SURGERY.

Arnott on Urethra .. ..	3
Ashton on Rectum .. ..	4
Bellingham on Aneurism .. ..	5
Bigg on Artificial Limbs .. ..	6
Bishop on Bones .. ..	6
Chapman on Ulcers .. ..	8
Do. Varicose Veins .. ..	8
Cooper (Sir A.) on Testis .. ..	9
Cooper's (B.) Surgery .. ..	9
Do. (S.) Surg. Dictionary .. ..	9
Curling on Rectum .. ..	10
Do. on Testis .. ..	10
Druitt's Surgery .. ..	11
Fell on Cancer .. ..	11
Fergusson's Surgery .. ..	11
Gay on Femoral Rupture .. ..	13
Do. on Ulcers .. ..	13
Harrison on Stricture .. ..	14
Higginbottom on Nitrate of Silver	15
Hodgson on Prostate .. ..	15
Hunt on Skin .. ..	16
Laurence on Cancer .. ..	18
Lawrence on Ruptures .. ..	18
Lee on Hemorrhoids .. ..	18
Liston's Surgery .. ..	18
MacLise on Fractures .. ..	19
Nottingham on the Ear .. ..	20
Nunneley on Erysipelas .. ..	21
Pirrie on Surgery .. ..	22
Skey's Operative Surgery .. ..	25
Smith on Stricture .. ..	25
Steggall's Surgical Manual .. ..	26
Thompson on Stricture .. ..	27
Wade on Stricture .. ..	29
Watson on the Larynx .. ..	29
Wilson on the Skin .. ..	31
Do. Portraits of Skin Diseases ..	31
Yearsley on Deafness .. ..	31
Do. on Throat .. ..	31

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